



THOMPSON'S GARDENER'S ASSISTANT





PLUMS.—

1, MONARCH. 2, TRANSPARENT GAGE. 3, GOLDEN TRANSPARENT GAGE. (NAT SIZE)

PLUMS

The Plum, the Damson, the Sloe, and the Bullace are all forms of *Prunus communis*, which is common in hedges, thickets, and open woods in Europe and in Western and Central Asia. Like the Apple and the Pear, the Plum was a favourite fruit with the Romans; the form of Plum cultivated at Damascus (whence Damascenes or Damsons) has a reputation which dates from the days of Pliny. The Chinese also are said to have cultivated different kinds of Plums from time immemorial. There are several hundred named varieties in the British Isles, some of which are of recent origin, but of many of them nothing is known beyond that they came originally from France. Seedlings generally show considerable variation, but, on the other hand, some varieties are said to come tolerably true from seeds, especially the Green Gage, Prune, Myrobalan, and Damson. In the United States of America a new race of Plums is now in process of evolution at the hands of breeders and cultivators, from sorts originated in Japan. An account of these will be found on page 162. It is usual to graft all varieties of Plums on the Mussel, or St. Julien, as a stock.

Three standard varieties of Plums are represented in the Plate.

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THE GARDENER'S ASSISTANT

A PRACTICAL AND SCIENTIFIC EXPOSITION OF THE
ART OF GARDENING IN ALL ITS BRANCHES

BY

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OF THE ROYAL HORTICULTURAL SOCIETY'S GARDENS, CHISWICK

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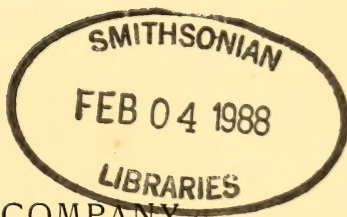
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ILLUSTRATED BY NUMEROUS ENGRAVINGS IN THE TEXT,
AND A SERIES OF PLATES IN COLOUR, AND OF PLATES IN BLACK-AND-WHITE

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THE GARDENER'S ASSISTANT

CHAPTER I.

FORMATION OF THE FRUIT AND KITCHEN GARDEN.

SITE FOR THE GARDEN—SOIL—SIZE—FORM—SHELTER—
LEVELLING THE GROUND—DRAINING—BORDERS FOR
FRUIT-TREES—SOIL FOR FRUIT-TREE BORDERS—
PREPARATION OF THE GROUND—WALKS.

The principal points to be considered in the formation of the Fruit and Kitchen Garden are—1. SITE. 2. SOIL. 3. SIZE. 4. FORM. 5. SHELTER.

1. *Site*.—In choosing the site, it is desirable that the ground should either be level, or slope gently to the south, south-east, or south-west. If level, it should not be so low as to prevent proper drainage. A slope to the east of south, or so as to face the sun at about eleven o'clock in the forenoon, is to be preferred. Steep slopes should be avoided, especially in parts of the country where the annual rainfall does not exceed an average of 24 inches, where the ground selected should either be level, or not sloping more than 1 foot in 50. In wet climates, a fall of 1 foot in 30 may be advantageous for early crops; but for walled-in gardens such steep slopes are inconvenient. The lower part of a slope is the best situation, as there the soil is generally of good quality, owing to the washing down of the richer parts from the higher ground, and the greatest benefit is derived from the rays of the sun. A flat, low-lying situation should be avoided, the subsoil in such places being usually damp and sour, and it cannot be easily drained. Hoar-frost also prevails on such spots, and it often proves ruinous to the crops.

An excellent form of garden is one with a regular declivity from north to south, in which direction a walk divides the area into two equal portions, each of which slopes uniformly from the side inwards to the central walk. The garden is thus generally inclined to the south, whilst the one-half has an eastern inclination, the other a western. In this way the sun's rays

have greater effect, and water runs off freely, but not too rapidly. If the ground was level from north to south, and sloped only from the sides to the central walk, then the water would naturally run direct from the sides towards the walk; but when the ground likewise slopes from north to south, the water will follow a diagonal course, and will be much more effective in refreshing the crops.

If the mansion is already built, and the ornamental grounds laid out, the fruit and kitchen garden should be placed in the best situation that the circumstances permit. When a mansion has to be built and gardens formed, the gardener ought to be consulted as to the position the different sections of the garden are to occupy.

Usually the front of a country mansion faces the south; but whatever its direction may be, the ground usually slopes from it. This position would be much too conspicuous for the kitchen garden, and it could not be easily screened. The north or reverse side of the mansion generally trends upwards in the view, and in such circumstances an eligible site for a garden is not often found in that quarter, or at a higher elevation than the mansion. A position in an easterly or a westerly direction from the mansion is more generally available, and it is undoubtedly preferable.

In whatever direction the garden may be placed, it should be effectually masked from view from the principal windows and front of the mansion either by natural undulations of the ground or by plantation of trees and shrubs. It should also be screened from view from the pleasure-grounds by the same means, as well as from the main carriage-drives. The distance at which it may be placed must depend upon the size of the mansion, and the extent of the surrounding pleasure-grounds. When these are extensive, the garden will require to be situated at a quarter of a mile or more from the mansion, but a shorter distance is desirable, both for the convenience of the proprietor and for the easy transfer of the garden produce to the mansion.

In the case of smaller establishments the kitchen-garden may be placed in close proximity to the house, or even occupy the whole ground on one side of it.

Fig. 788 is a plan showing the position of the kitchen-garden in relation to the house and other parts of the garden.

If the kitchen-garden is situated directly south from the mansion it cannot be entered without

the first view being among the most uninviting in the whole garden, that of sheds and other buildings behind the glass structures, which are generally of such a description as should be concealed as much as possible. If situated to the north, such an objection does not arise, the houses being then approached directly in front. But on the other hand, when the kitchen-garden is north of the house, it can rarely be screened

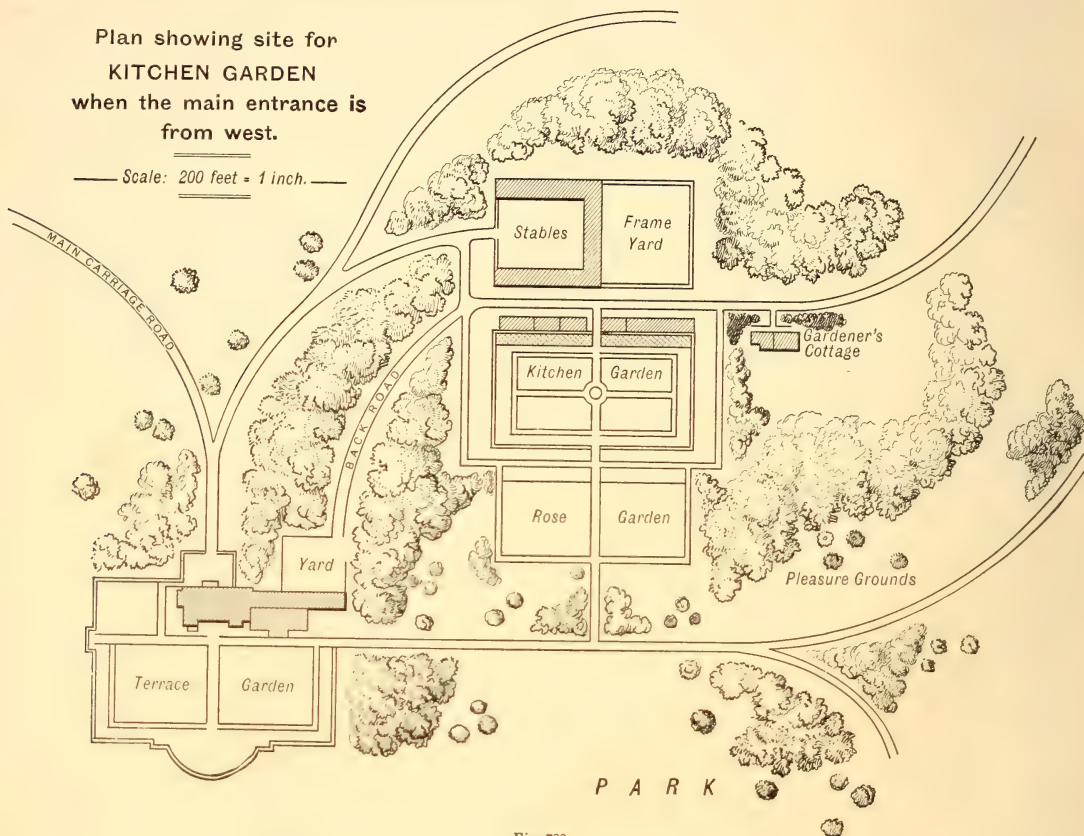


Fig. 788.

by means of plantations of trees without sacrificing a considerable portion of light. If, however, the site is either on the east or west side of the mansion, these objections will not apply; neither will they if the situation is in a south-east or south-west direction from the mansion.

Generally a position on the east side is to be preferred, especially where the contour of the ground requires artificial shelter to be formed against the north and north-east winds. Supposing the ground to be level, and the garden placed to the south-west, then to shelter it from the north and north-east winds, high trees at some distance, as they ought to be from the garden, would certainly interfere with the pleasure-grounds; whereas, if the garden is

placed on the east side, the necessary shelter would be farther from the mansion than the garden itself, and therefore would not come within the space required for ornamental purposes.

2. *Soil.*—The nature of the soil in a garden is of primary importance, although in the first instance it may be subordinate to the site and exposure, which when once fixed are intended to be permanent. Soil, on the other hand, can be altered and improved to suit the crops at the pleasure of the owner, and at a comparatively small cost. The best soil for a kitchen-garden is a good sound loam of a slightly calcareous nature, or a sandy loam mixed with certain proportions of lime and humus to render

it fertile. The former is most suitable for the growth of fruit-trees, while the latter is more desirable for early crops of vegetables. A light, free soil is also more amenable to cultivation in all states of the weather, and under proper treatment is as productive as a heavier loam. While the greater part of the vegetable quarters should therefore be composed of a rich, light, friable loam, it would be advisable in most cases to have a portion of a stronger texture in order to suit crops that thrive best in a strong soil.

The depth of good soil for a fruit and kitchen garden should be about 3 feet. If the situation is damp, the soil may be shallower according to circumstances, but in no case should it be less than 18 inches in depth. When the natural soil is less than 24 inches, it should be made up to that depth by the addition of good surface soil, as it is not advisable to trench up and mix much of the subsoil with it. Indeed, in some cases, gardens have been almost ruined by injudicious trenching and mixing of the subsoil with the surface mould.

The subsoil should also be carefully examined, for if it is sour and bad, or contains too much iron, a site should be sought for elsewhere, however suitable the top soil may be. When the surface-soil is good, the trees may grow well for several years, or till their roots penetrate into the bad subsoil, but just at the time when they should be in a full bearing state, they begin to exhibit symptoms of decay; and instead of bearing good crops, and attaining a healthy old age, prove a ruinous failure, or necessitate the adoption of a costly process of continuous root-lifting, to maintain a precarious and often disappointing state of fertility.

The choice of soil is affected by three considerations: the quality of the soil itself, the nature of the subsoil, and the position with reference to the mansion, as already indicated. It may fortunately happen that a good soil and subsoil exist in the most desirable situation, and when this is the case, the matter of course is easily settled. But the situation and subsoil may be good, whilst the top-soil is bad, when it may be a question whether the two good qualities should not be taken advantage of, and the top-soil improved.

The solution of this question will depend on the amount of money allowed to carry out the improvement. If the top-soil is too thin, the necessary thickness must be made up by the introduction of proper soil from other places where it can be spared. The good surface-soil thrown out in digging for the foundations of

walls, or other buildings, and for the bottoms of walks, should be economized for the purpose. If the requisite additional soil has to be taken from a grass field, the surface should be removed in strips, in order that the field may be injured as little as possible. A rich old pasture affords excellent garden soil, and it should be removed in the manner that will do the least injury to the field. If the entire surface is removed from, say, half the field, that half in most instances would not soon recover. But if the whole surface is lined off in strips, say 15 inches wide, and only every other one taken off a spit deep for the garden, and the field be well manured and trenched across the strips, it will soon recover its loss, which, in fact, by this mode will be scarcely apparent a year afterwards under good management; whereas, the effects of the removal of the entire surface would be plainly visible, under the best of treatment, for many years.

The area of the garden being known, less that of the walks, and the depth of soil required to be added being also ascertained, the number of cubic yards to be brought in can easily be calculated, and estimated for. It then becomes simply a question of expense, as to whether the garden can be formed in the best situation and on a good subsoil or not. It should be borne in mind that pleasure-grounds can be laid out, and altered, if this should prove desirable; but such is not the case with a fruit and kitchen garden, surrounded by walls, and furnished with numerous structures. Therefore, it is most desirable to have it established in the best situation, although at some considerable expense for soil in the first instance. Rather than it should not be so placed, a portion of the ground, say a half or one-fourth, including borders and where trees are to be planted, could be done in the first instance; and soil could be collected for making good successive portions, till the whole was completed.

Where the subsoil is at fault, the remedy is more difficult. If only some portions of it are bad, these may be removed and a better kind substituted. When too much iron is present in the subsoil, the latter may in certain cases be overlaid with concrete, lime, or chalk, for if this be well rammed, the roots of trees will not readily penetrate through it. Or, if the ground be thoroughly drained at a depth of $3\frac{1}{2}$ to 4 feet, and the soil trenched about 18 inches deep, placing some inches of good drainage at the bottom, the iron oxide will be washed down, and carried off by the drainage, and the in-

jurious action of what remains may be wholly or partly counteracted by repeated dressings of lime or chalk. By such means the subsoil may be greatly improved; but in all cases where it is not naturally good, or not completely sealed by concrete or other substances from the access of roots, the top-soil should be made so deep that there may be plenty of good nourishment for the plants without their roots having to

seek deep down in the subsoil after that which is indifferent or bad.

3. *Size*.—The size of a garden depends on various circumstances, but it should be in proportion to the capacity of the mansion and the number of its inhabitants, so as to afford an ample supply of fruit and vegetables. In estimating the proper size of a kitchen garden, it has to be borne in mind that the whole of the

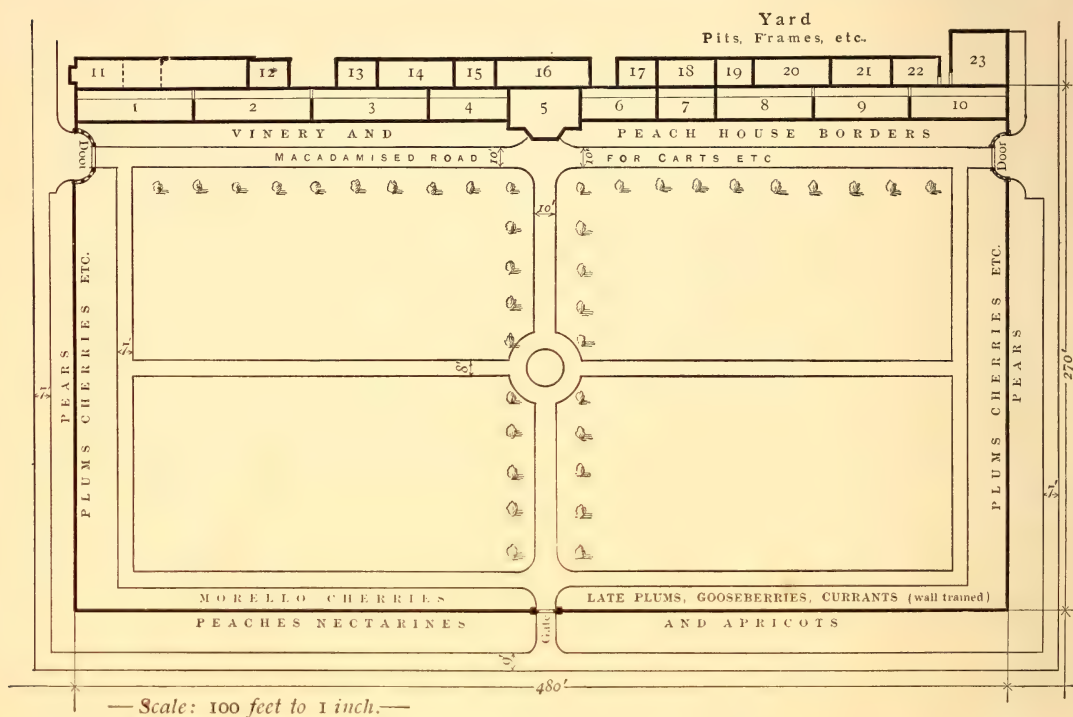


Fig. 789.—Plan for a large Kitchen-Garden. 1-23, Houses, Sheds, Boiler-house, &c.

working establishment of the garden department is usually included within its precincts, and it is therefore necessary to provide room for glass structures of various descriptions, offices, stores, yards, and other conveniences, as well as for residences for the head and under gardeners. The space required for these in well-organized gardens is generally about one-third of the whole enclosed area, which should be surrounded by a substantial vermin-proof fence. In regard to the area required to supply an establishment regularly throughout the year with abundance of first-rate fruit and vegetables, a general rule is to allow an acre of well-cultivated ground for every twelve grown-up persons to be supplied. On good soils, and under skilful management, this allowance will be found to be ample, especially where the main crop of potatoes is grown on the farm.

In some instances the slips outside the garden

may be of considerable extent; or, on account of the boundaries, or of arrangements connected with pleasure-grounds, they may be more or less limited on one or other of the sides. These circumstances will accordingly require to be taken into consideration when determining the extent of the area to be enclosed by walls. In the colder parts of the country, and especially where the situation is rather high and exposed to cold winds, the walled-in garden ought to be proportionately larger, shelter being, under these circumstances, required for many productions which in milder climates could be grown in the field or open garden. If there is an orchard to supply the hardier fruits, the garden may be much less than where fruits will scarcely grow except on walls.

By a system of intense cultivation and close cropping, a large quantity of vegetables may be grown in a comparatively small space. Vege-

AT WELBECK

1. Centre Division, Kitchen Garden, 6 acres.

- | | | | | | |
|---------|---|---|---|-----|----|
| 2. West | ” | ” | ” | } 8 | 75 |
| 3. ” | ” | ” | ” | | |

- | | | | | | | | |
|----|-------|---|---|---|---|---|---|
| 3. | " | " | " | " | " | " | " |
| 4. | First | " | " | " | " | 6 | " |

4. First " " " 6 "

5. Brick Strawberry Beds, for covering with glass.

6. Bush Fruit Division, Kitchen Garden,
4 acres.

7. Orchard.

8. Back Road to Gardens.

9. Coke Yard.

10. Bothies.

- ## II. Gas-works.

- ## 12. Avenues of Limes.

13. Tan Gallop, $\frac{1}{4}$ mile long.

14. Lodge at Back Entrance.

15. Fig Range, 300 feet long.

16. Plant Houses, 300 feet long.

- I7. ,, ,,

- ### 18. Late Vineries.

- ### 19. Tropical Conservatory.

20. Cool ,

- ## 21. Muscat Vineries.

- ## 22. Early Peach Houses.

- ### 23. Two Ranges Forcing Houses

24. Gardener's House.

25. Lawn.

- ## 26. Forcing Houses.

- ### 27. Beds for forcing Asparagus.

28. Peach Case, 250 feet long.

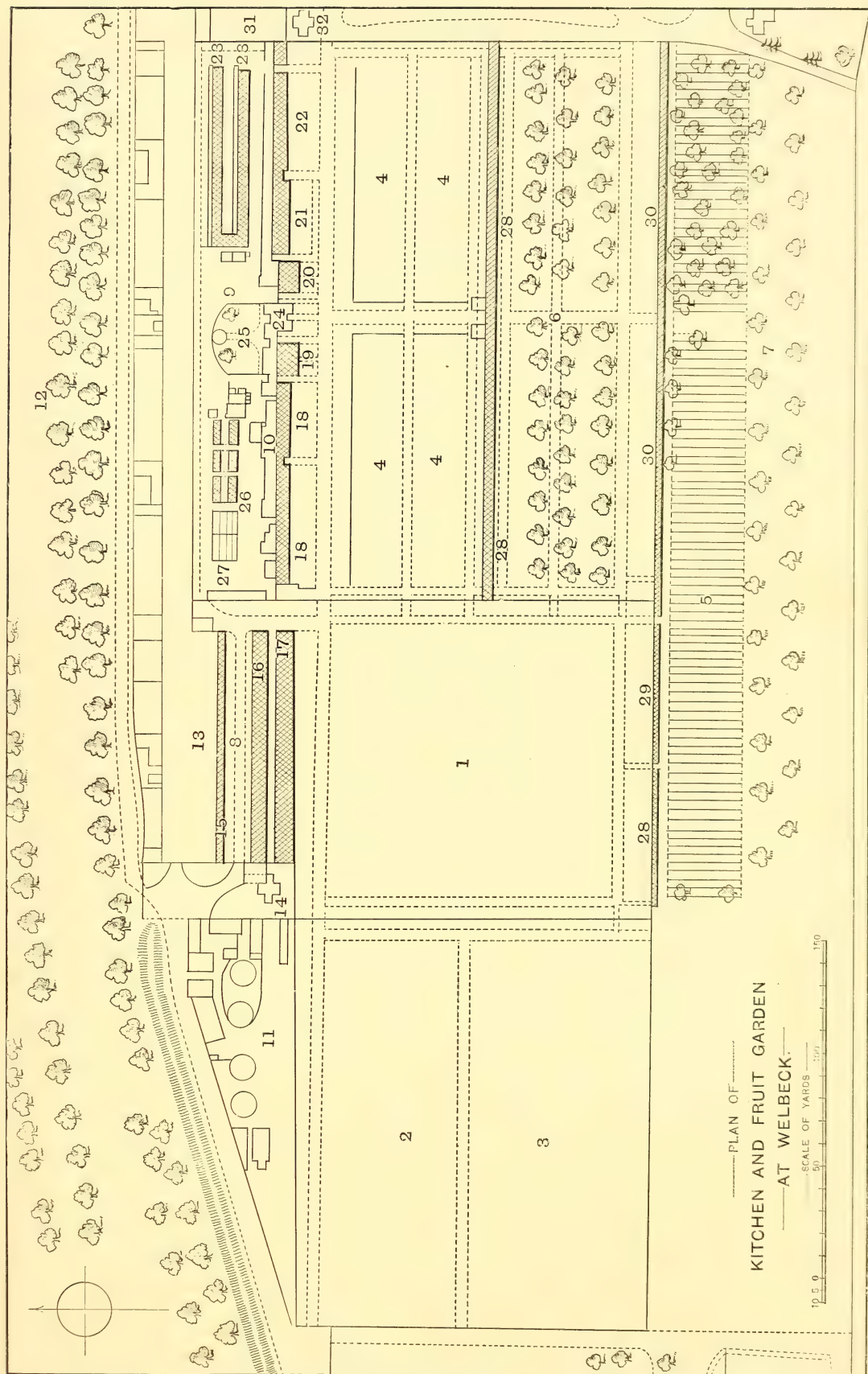
29. Plum " "

30. Apricot „ 700 „

31. Cherry House.

- ### 32. Entrance Lodge.





tables, however, when so raised, are not generally so rich in flavour and fine in quality as when the different crops have plenty of room. Abundance of space is better than too little; for if, at any time, the whole should not be required for culinary vegetables, the spare ground may be used for growing any other crops that may be found most profitable; or a portion may be occasionally laid down in grass,

which will refresh it for the growth of vegetables again. At all events, the ground need not be in any way wasted, however much more it may be than is absolutely necessary for a due supply of vegetables. Where ground is at command, the question of the extent of it to be enclosed, depends greatly on the expenditure that can be allowed for walls, a tolerably correct idea of the expense of which may be formed

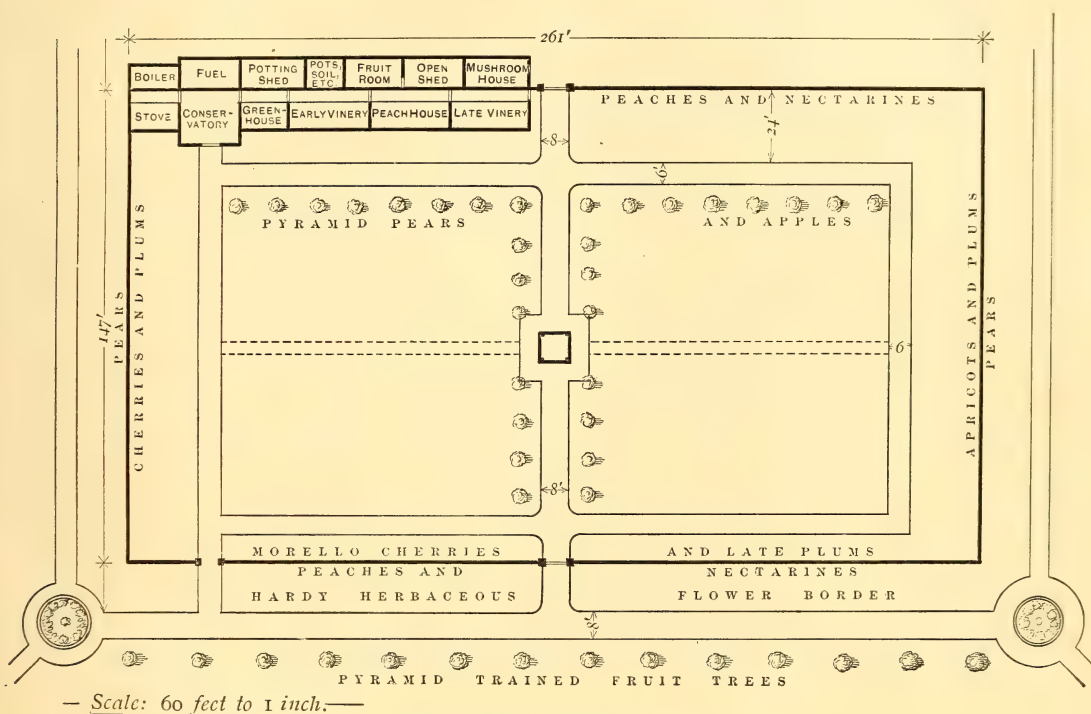


Fig. 790.—Plan for a small Kitchen-Garden.

from the relative amounts given on p. 9 for enclosing from 1 to 6 acres. Less than an acre can only be enclosed at a very great expense for walls in proportion to the extent of the ground. A garden of 6 acres of cultivated ground is enough to meet the wants of a large establishment of seventy to eighty persons; and in general, a fruit and kitchen garden of 4 acres will be found sufficient to supply all the ordinary demands of a moderate-sized establishment.

Plans of kitchen-gardens, showing positions of plant-houses, sheds, &c., are shown in figs. 789 and 790.

4. *Form.*—The form of a garden is not of material consequence in the cultivation of vegetables, which, with the exception of such as may require a south border, will succeed as well in a piece of irregular ground as in one of any other shape. But when the area is not rectangular, there is

additional trouble and loss of time in carrying out the working operations. As fruit and kitchen gardens are generally surrounded by walls, the form of the garden and length and aspect of walls become important considerations. Much depends upon the surface the wall presents to the action of the rays of the sun during the period of the day when they are most powerful. From the following observations, recorded by Professor Daniell in his *Meteorological Essays*, that period appears to be between one and two o'clock in the afternoon. The observations were made in the month of June. "The day was perfectly calm and cloudless, and the atmosphere so clear that the disc of the moon was visible throughout the day. The dew-point by the hygrometer was stationary at 57°."

It will be observed from the table that the highest temperature in the shade occurred be-

Progress of Solar Radiation from Morning to Evening.

THERMOMETER.			
Time.	In Sun.	In Shade.	Difference.
9 A.M.	93°	68°	25°
9½ "	103	69	34
10 "	111	70½	40½
10½ "	119	71	48
11 "	124	71½	52½
11½ "	125	72½	52½
12 M.	129	73	56
12½ P.M.	132	74	58
1 "	141	74½	66½
1½ "	140	75	65
2 "	143	75½	67½
2½ "	138	76	62
3 "	138	76½	61½
3½ "	132	77	55
4 "	124	76	48
4½ "	123	77	46
5 "	112	76	36
5½ "	106	75	31
6 "	100	73	27
Means.....	124¾	73½	51¼

tween three and half-past four p.m.; but the power of the sun's rays was greatest between one and two p.m. Although the observations were only taken for one day, yet it was well selected for the purpose by one who was accounted an authority on the subject. As trustworthy observations of this nature are important to the subject in hand, the following additional extract is given from the same work:—

“The mean results of five series of experiments, conducted with every possible precaution, are contained in the following table, showing the power of the sun's radiation from half-past nine a.m. to half-past six p.m., in the month of June:—

Progress of Solar Radiation from Morning to Evening, in June, upon an average of five experiments.

Time.	Force of Sun's Rays.
9½ A.M.	32°
10½ "	46
11½ "	55
12½ P.M.	63
1 "	65
2½ "	63
3½ "	58
4½ "	49
5½ "	35
6½ "	29

Here it will be observed that the force of the sun's rays at half-past nine a.m. is on the average 32°, and that it increases between one and two p.m. to its maximum, 65°, or to rather more than the double of what it was at half-past nine a.m. It will also be seen that it increases rapidly between the hours half-past nine, half-past ten, half-past eleven, and half-past twelve; and then during the next two hours the force is nearly uniform.

Moreover, the average force of the sun's rays in the three hours before twelve noon, is, according to these observations, about 44°; and in the three hours after twelve it is 62°. From this it is evident that a wall with a west aspect must be much warmer than one with an east aspect. The sun shines in a clear day as long on the one as on the other, but not with equal intensity. For three hours before noon the sun shines on the east aspect at the same mean angle as he does on the west aspect for three hours after noon; but during the latter period his rays have, according to the above observations, about 40 per cent greater intensity. The wall with the west aspect must therefore become much more heated than the one with the east aspect. After half-past three p.m., the power of the sun's rays begins to decline considerably, but as some compensation for this they impinge more directly on a west wall.

The southern aspect being the most important, requires to be taken first into consideration. It may, according to circumstances, face either directly south; or it may be inclined to the south-east, so as to face the sun about eleven a.m.; or it may incline to the south-west, to face the sun about one p.m. In parts of the kingdom where the summer heat is sufficient to ripen Peaches and Nectarines on a wall facing the sun at eleven a.m. that aspect should be chosen, as in that case the adjoining walls can proceed at right angles, and afford two good western aspects, on which the sun may commence to shine as early as eleven a.m., so that Apricots, Plums, Cherries, and Pears, could be ripened to perfection upon it. But, if the heat against an aspect thus inclined an hour to the east of the meridian is not sufficiently intense to ripen Peaches satisfactorily, the aspect must face the sun at noon; and where the climate is still colder, it will be advisable to turn the aspect to face the sun at one p.m. The walls should, if possible, be at right angles to each other.

With regard to the aspects of the other walls, it would not be desirable that each should receive an equal amount of sun-heat in the course of the day; for if this were the case, the consequence would probably be that although many of the finer varieties of Pears, &c., could be grown on both sides of the wall, yet none of the fruit would ripen to perfection. The eastern aspect must be planted with such things as are most suitable, chiefly summer or early autumn fruits; for, owing to the ripening period of these being nearly that at which the hottest weather occurs, an indifferent aspect will ripen them tolerably

well. Next, therefore, to the southern aspect, one that will be as little as possible inferior to it demands attention.

Where the southern wall faces the sun at eleven a.m., the western aspect, if at right angles to it, will have the sun, as already observed, from eleven in the forenoon, and would then be inclined to the south of west as much as will ensure the ripening of the fruits required to be produced against that wall. Where the wall on the north side runs from east to west, and of course faces directly south, the walls joining it will run north and south, but then the west aspect will have an hour less sun than in the preceding case, and consequently some things that would require that hour of additional sun could not be properly grown against it, and they would need to be planted against the south wall, which, therefore, would have to be extended to afford space for them.

Where the southern aspect must face the sun at one p.m., and the walls joining it proceed at right angles from it, their western aspects will be shaded till one p.m., and rendered so much inferior as to be unfit for the ripening of such fruits as require an aspect little inferior to that of a south wall. This can only be obviated by giving the walls on the eastern and western sides such a direction as to present western aspects that will receive the sun's rays as early as eleven a.m., although, by so doing, these walls will not join the others at right angles. The garden will then assume the form of a rhombus (fig. 791), or that of a rhomboid (fig. 792). These shapes are somewhat inconvenient for economically working the ground, and in dividing it into sections for the various crops; but the latter will grow equally well, whilst a considerable advantage is secured in regard to the ripening of fruits. The opposite sides of these figures being parallel, all the borders, beds, and quarters in the garden can also have parallel sides; and this being the case, although their ends do not square off, yet they are more easily worked than if the ground were wider at one end than the other, which must be the case where the opposite walls are not parallel.

From the foregoing statements it appears that the walls of a fruit and kitchen garden should have the following directions, according to the climate of the locality:—

1. In the warmer parts of Britain, the walls on the north and south sides should face the sun at eleven a.m., and the walls on the east and west should run parallel to each other, and at right angles with the north and south walls.

2. Where the climate is not quite so good the north and south walls may face direct south, with the east and west walls at right angles, and consequently running in the direction of the meridian. If the south aspect of the walls, however, is of limited extent, the east and west walls may with great advantage run in the direction of the sun at eleven a.m., as in fig. 791.

3. In places where the hottest aspect is necessary to ripen Peaches and Nectarines, the wall on the northern side may be made to face

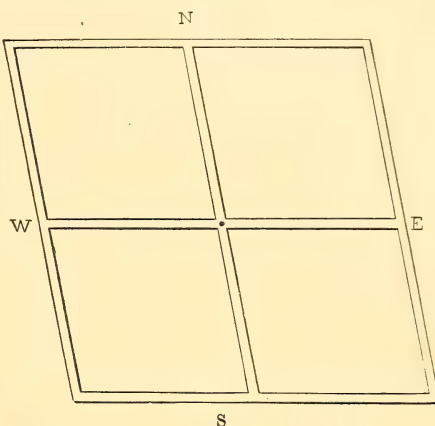


Fig. 791.

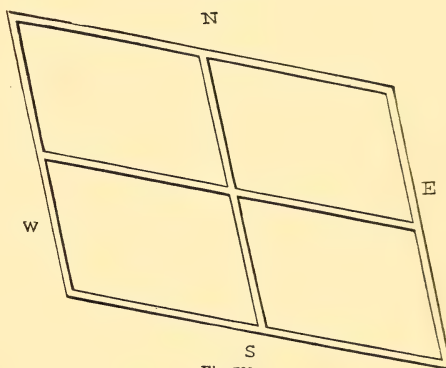


Fig. 792.

Position of Kitchen-Garden Walls.

the sun at one p.m.; and the walls on the eastern and western sides should then run in the direction of a point in the horizon above which the sun is perpendicular at eleven a.m., as in fig. 792.

Where the Peach succeeds well on open walls, their position may be as in No. 1 instance. Where rather colder, the aspects pointed out in No. 2 may be adopted; and in the northern parts of Britain, the direction of the walls as described in No. 3 would be most proper. Where the situation is too cold or northerly for the cultivation of Peaches and Nectarines on open walls, the southern aspect should be

occupied with Apricots, Plums, Cherries, and Pears. It is not absolutely necessary that the southern aspect should face or be exactly at right angles to the sun's rays at the hours mentioned, nor that the eastern and western walls should follow the direction of the hour-lines. Nevertheless, the hour-lines are a convenient guide, and they may be easily found with sufficient accuracy by a good watch, allowance being made for the equation of time.

Table of the Angles which the Hour-Lines form with the Meridian, or Twelve o'clock Line, for every half degree of Latitude, from 50° to 59°.

Latitude.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
	11.	1.	10.	2.	9.	3.	8.	4.	7.	5.
50° 00'	11° 38'		23° 51'		37° 27'		53° 0'		70° 43'	
50 30	11 41		24 1		37 40		53 11		70 51	
51 00	11 46		24 10		37 51		53 24		70 58	
51 30	11 51		24 19		38 4		53 36		71 6	
52 00	11 55		24 27		38 14		53 46		71 13	
52 30	12 00		24 36		38 25		53 58		71 20	
53 00	12 5		24 45		38 37		54 8		71 27	
53 30	12 9		24 54		38 48		54 19		71 34	
54 00	12 14		25 2		38 58		54 29		71 40	
54 30	12 18		25 10		39 8		54 39		71 47	
55 00	12 23		25 19		39 19		54 49		71 53	
55 30	12 28		25 27		39 29		54 59		71 59	
56 00	12 32		25 35		39 40		55 8		72 5	
56 30	12 36		25 45		39 50		55 18		72 12	
57 00	12 40		25 51		39 59		55 27		72 17	
57 30	12 44		25 58		40 9		55 37		72 22	
58 00	12 48		26 5		40 18		55 45		72 27	
58 30	12 52		26 13		40 27		55 54		72 33	
59 00	12 56		26 20		40 36		56 2		72 39	

For a place in latitude 52° 30', it will be seen, by referring to the above table, that the eleven o'clock line forms an angle of 12° with the meridian, or twelve o'clock line; the one o'clock line forms the same angle, but, of course, on the opposite side. Those who are acquainted with practical geometry, or with the rules of trigonometry, will easily find the means of laying off with sufficient exactness the above or any other angle.

The space most eligible for a garden, as regards soil and other circumstances, may not admit of any of the forms we have recommended; nevertheless, the best form should in all cases be approximated as much as possible. If length from north to south can be obtained, but not from east to west, then the requisite extent of south aspect may be secured by one or more walls running across the garden. In hot summers certain fruits will ripen on a direct east or west aspect; but they will only do so imperfectly in ordinary seasons. We should not, however, be guided by exceptions. It is much better to have one good aspect than two that are indifferent.

The form of the garden must now be con-

sidered with regard to the extent of wall, and the area enclosed thereby; for some forms require a much greater length to enclose a given area than others. Within any given extent of outline, the circle contains the greatest area; next to it regular polygons; these figures, however, are but little adopted in gardens, more especially in fruit and kitchen gardens. For such, rectilinear four-sided figures are the most convenient; and of all these, the square contains the greatest area in proportion to the extent of outline. This form is therefore the one to be adopted, when the object is to enclose by four sides as much ground as possible within the least extent of wall. The more any four-sided figure deviates from a square, either as regards the similarity of the angles or the equality of the sides, the less will be the area enclosed, compared with the length of the boundary. For example, if two acres be enclosed in the form of a square, the length of the boundary will be about 1180½ feet, and the length of each side about 295 feet. With the same length of sides, but thrown a little out of the square so as to form a rhombus, as in fig. 791, the area would be nearly 7½ rods short of 2 acres.

The total length of wall that would be required to enclose a square of 2 acres, would not enclose so much by 20 rods, if the figure was a parallelogram, of which the length is to the breadth as five to three. For 2 acres this form would require to be in length 381 feet, and in breadth 228½ feet; consequently the total length of enclosure would be 1219 feet. It may here be observed that the expense of enclosing a garden is greater, in proportion to the quantity of ground enclosed, for a small garden than for a large one. Thus the total length of enclosure for—

1 acre, in the form of a square, would be	835 feet.
2 acres,	1,180 "
3 "	1,446 "
4 "	1,670 "
5 "	1,866 "
6 "	2,045 "

From this it appears that whilst 4 acres require 1670 feet, one-fourth of the length of wall will not enclose one-fourth of the area; for 1 acre requires just half as much walling as 4 acres. Of course a large garden must require more to enclose it than a small one; but, at the same time, the larger the garden the less will be the expense per acre enclosed. Supposing the walls to be 12 feet above ground, with a foundation 3 feet deep, in all 15 feet from base to top,

estimating the brickwork at £16 per rod, the expense of enclosing—

1 acre would be about.....	£736
2 acres ,, 	1,040
3 ,, ,, 	1,276
4 ,, ,, 	1,472
5 ,, ,, 	1,647
6 ,, ,, 	1,800

From this it appears that the enclosure of a single acre, according to the above estimate, costs £736; but when 6 acres are enclosed together, the amount is £1800, or at the rate of only £300 for each acre enclosed. It will be evident, from what has been stated, that where it is an object to enclose a certain area with the least extent of wall, the garden, presuming that it is to be four-sided, must be in the form of a square. If, on the contrary, the object is to have a large extent of wall in proportion to the area enclosed, then the garden must deviate accordingly from the square, and be made to assume the form of a rhombus, the sides being equal; of a rhomboid, an oblong figure with the ends oblique; or of a parallelogram.

The southern aspect is so advantageous for the ripening of fruit that it ought to be kept chiefly in view in forming a garden. In bad seasons other aspects may fail in bringing fruits to perfection, and in such seasons, well-ripened fruit is more especially valuable, and the best chance of obtaining it is from a southern aspect. On that account it is desirable that the garden should be of a form which affords a greater extent of wall with a south than any other aspect.

The form may therefore be that of a parallelogram, of which the length is as five to three. Fig. 793 is very nearly in this proportion, and

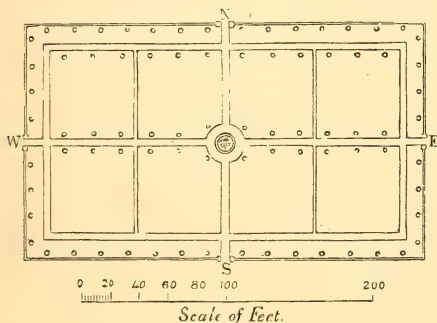


Fig. 793.

represents a small garden, 272½ feet from east to west, and 160 feet from north to south; consequently it contains exactly an acre. On referring to the figure, it will be observed that it admits of nearly double the number of trees

on the south aspect, as compared with each of the others; and it allows a greater extent of espaliers to face the south, which is also important, as the fruit is more fully exposed to the sun throughout the hottest period of the day than it is in espaliers running north and south. Moreover, the figure admits of being divided into eight principal compartments, each of which forms nearly a square, after allowing for the space occupied by espaliers. Although it is not absolutely necessary to adopt exactly the above proportion of five in length to three in breadth, yet it will be found well suited for the convenient working of the ground, and for the ripening of fruits on walls and espaliers. The main area of the royal gardens at Frogmore is nearly in the above proportions, being 760 feet from east to west, and 440 feet from north to south.

Various other forms of gardens have been recommended, as well as different directions of the walls. Most authorities, however, agree that a square or parallelogram is the most convenient; but they differ in regard to the direction of the walls, and as to whether the length of the garden should be east and west, or north and south. Some recommend the walls on the eastern and western sides to face directly east, or between east and south-east, in order to have sun for a longer period during the early part of the day; we have already stated our reasons for differing from this. Others make the length of the garden run north and south, in order to have comparatively little extent of north aspect. As already explained, we prefer to have a considerable extent of aspect decidedly good, rather than a small extent possessing this character, together with a large proportion indifferent in that respect.

Taking all things into consideration, perhaps on the whole a parallelogram such as fig. 793 is the best form that can be generally recommended. It has, at least, the advantage of being rectangular and of a compact form for being economically worked; and whilst it presents a large proportion of walls with the very best aspect, it possesses very little with a decidedly bad aspect.

5. *Shelter*.—In selecting the most desirable site for a garden, that affording the best natural shelter should be taken advantage of, where it can be done consistently with other necessary arrangements which must also be kept in view. But where the natural disposition of the ground affords little or no shelter, recourse must be had to artificial means for supplying it. Walls it

is true, afford a certain amount of shelter to the interior of a garden, and by absorbing heat from the sun, and radiating it again, a warmer atmosphere is generated within the garden and near the walls. It often happens in unsheltered gardens, especially in changeable spring weather, that, after the sun has heated the air in the interior during a clear and comparatively calm period of the day, and the motion of the sap has been stimulated in consequence, the sky becomes overcast and strong gusts of cold wind begin to blow and sweep through the garden, and quickly displace, by their mechanical force, the warmer and lighter air.

Walls afford good shelter when there is little wind, and that steady; but when there is much, it eddies round the inside of the walls, and produces far more injurious effects on the vegetation it meets on its course than it does on that which is entirely in the open ground, and not subjected to intermittent excitement. It is therefore of great importance that the progress which vegetation makes in a garden should be as much protected as possible from sudden checks; and this protection mainly consists in moderating the impact of cold winds.

Plantations should therefore be made, if possible, on the north-west, north, and north-east sides; the winds from these quarters being coldest. The shelter on the north and north-east of the garden should approach nearest to it, for these are the winds most to be dreaded. The nearer the shelter, the more it will shade the garden, and the less light will the plants receive. But what can be grown on north and north-east aspects is of little importance compared with the subjects on the other and better aspects; so that the shelter of the latter is more to be considered than the partial loss of light to the former. Along the north side, the screen may be as near as 60 feet, depending partly on the kind of trees employed; and at about the same distance off the screen may turn the north-east and north-west corners, but should then gradually open out to the south-east and south-west, with a free exposure to the south. After turning the north-west and north-east angles, the latter of which should be specially guarded, the shelter, instead of being a continuous belt, may consist of clumps at intervals, having a general direction to the south-east and to the south-west, with other clumps farther off, and opposite the intervals.

A plan of a kitchen-garden indicating the disposition of the shelter-belt of trees is shown in fig. 794.

The trees employed for shelter should be tall and quick-growing species. In these respects perhaps none excels the black Italian Poplar (*Populus monilifera*). It will form a good shelter in a few years, especially if the ground is well trenched and manured previous to planting, and afterwards kept clean, when it will increase about 4 feet annually till it reaches a height of 60 feet or more. The Larch and Sycamore are also quick-growing trees, and the same may be said of the Lime (*Tilia europæa*). The latter may be pruned and trained so as to form a close screen, or tall hedge, from the ground upwards. The Elm and Beech ultimately become lofty, but their growth is slower. Where the soil is suitable, the Norway Spruce (*Picea excelsa*), the Scots Fir (*Pinus sylvestris*), the black Austrian Pine (*Pinus austriaca*), and the Corsican Pine (*Pinus Laricio*), answer the purpose well, and form excellent shelter-belts. In maritime districts, and especially in the milder parts of Britain, *Pinus insignis* and *Cupressus macrocarpa* grow fast, and make first-rate shelter; and the hardier *Thuia gigantea* and *Cupressus Lawsoniana* are very useful and effectual shelter-giving trees.

The belt should be not less than 20 yards wide, and should be planted so that the quickest growing trees are on the inner half, and the sturdier and more branching species on the outer edge, where they are most exposed to the wind. The Poplar, for instance, mixed with Spruce, or the giant Arborvitæ, should be planted next the garden, and some slower-growing trees, such as Elm, Beech, Sycamore, Scots Fir, Austrian Pine, or Lawson's Cypress, according to the nature of the soil, will form the outer half of the belt. By its rapid growth the Poplar quickly forms a shelter, and if its appearance is not liked, the trees may be cut down when the other kinds are high enough to afford protection.

If some outposts in the form of kidney-shaped clumps of trees were established, the force of the wind would be considerably broken before it reached the belt. The clumps would be most effective if arranged with their convex side outwards in two series, and they may be at the distance of 200 or 300 yards. The clear distance between the clumps in each series should be about equal to their length, and the intervals so formed should be covered by the clumps in the second rank or series. In passing through between the outer clumps the velocity of one portion of the wind will tend to neutralize the force of the air sweeping round the end

of the adjacent clump. If their forces should coalesce to a considerable extent, and the wind proceed in a direct course after squeezing through between the exterior clumps, it will impinge upon the clumps placed inside, opposite the intervals, and afterwards, with a broken-up and greatly diminished force, it will have to encounter the regular belt, which would effectually neutralize its force, and thus protect the

garden from the evil effects of a biting cold blast.

As a means of preventing the wind from sweeping along the external surfaces of the walls of a garden, diagonally projecting walls, or high hedges, at each corner of the garden have been recommended, and are met with occasionally. For reasons which can be easily understood, such walls are not effective in pre-

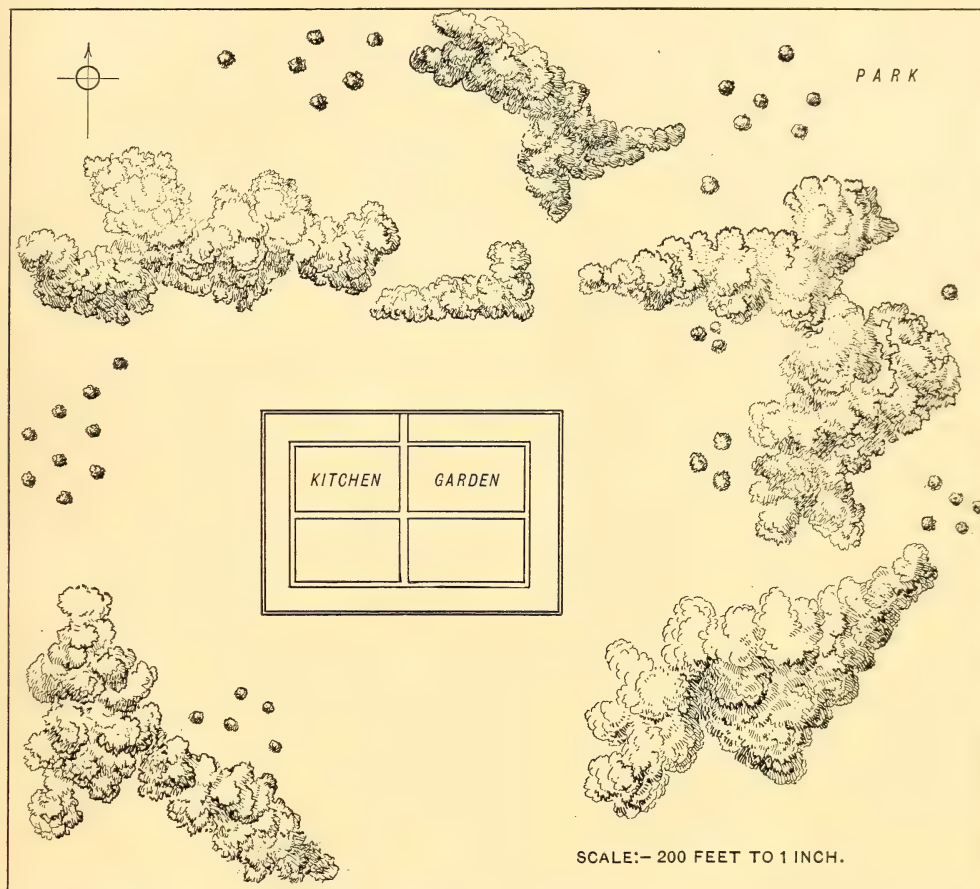


Fig. 794.—Site for Kitchen-Garden in a flat and exposed situation, showing positions of plantations to shelter the garden from north, east, and south winds.

venting the winds sweeping the face of the garden walls. Instead of a diagonally projecting wall at each corner it would be better to extend the wall on the north side of the garden beyond the eastern and western walls as far as the breadth of the respective borders, or even to the outside of the slip. By this means, also, an additional length of wall with a southern aspect will be secured. If the wall cannot be so extended, a high close hedge may be easily reared, which soon forms an excellent screen, and is much superior to a wall in all respects as a wind-break.

LEVELLING.

After the site, size, and form of the fruit and kitchen garden have been decided upon, the next step is to determine the level of the ground, or the slope thereof, as the case may be. Walls cannot be built to any required height above the ground until the height of the surface of the soil is known. The ground may appear to be level, but it is necessary to determine whether it is really so or not; and if it is found to be irregular, the height of the plane which it will present when the irregularities of

the surface shall have been levelled, is necessary to be ascertained. If this be done with sufficient accuracy, a proper datum-line, or starting-point for the height of walls and other structures, the surface of the walks, the depth of the drains, &c., will have been obtained. Here it is evident that some knowledge of levelling is necessary; and as much expense has been too frequently incurred for want of such a knowledge, some plain directions on the subject may prove useful, and lead to better results, with less expense than is usually the case when the operation of levelling the ground is commenced in hap-hazard fashion, and the result left to chance.

Supposing a plumb-line to be suspended from p (fig. 795), it is evident that it would hang in

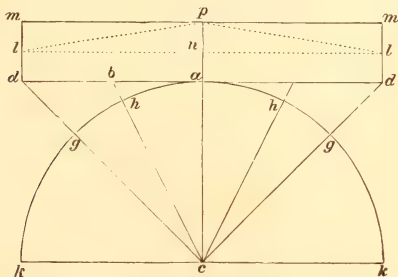


Fig. 795.—Levelling.

the direction of the line pc , or towards the centre of the earth. Any line crossing this at right angles, as dd , is generally termed the horizontal line, the line of sight, or the apparent level.

It is scarcely to be supposed that a gardener can command a spirit-level so nicely adjusted that the line of sight will be perfectly horizontal when the bubble is in the middle of the tube. Its line of sight may direct to a point too high or too low, but by placing the instrument exactly in the middle, as at p (fig. 795), any error arising from the above cause may be avoided. If the instrument at p , when the bubble is in the middle of the spirit-tube, has its sights directed to l , say on the right, it is evident that that point is below the horizontal line; and when the instrument is turned round, it will point as much below the horizontal line at l on the left. These two points ll are both in the same horizontal line, although not in that of the instrument; for the distance being equal, the error is equal on both sides. It increases in proportion to the distance; therefore, if the instrument were not placed exactly in the middle, the two points ll would not be equidistant from mm , and consequently the straight line between the two former would not be parallel to the horizontal

line of sight. In all cases, therefore, where the instrument is not of the most perfect description, and particularly well adjusted, it should be placed half-way between the staves, on which points in a horizontal line are to be marked. It may be observed, that on viewing from l to l , the error of the instrument will be seen to be pn ; by measuring that distance from l to m , and then adjusting the sights of the instrument so that they will direct to m whilst the bubble is in the middle of the spirit-tube, a level may then be taken for a short distance without risk of any material error, even although the instrument should not be placed midway, which may not be possible in some cases.

To level a line, as, for example, that intended for the edging of a walk, prepare a lozenge-shaped piece of wood (fig. 796) about 6 inches broad; paint it white, with the exception of an inch all round the margin, which should be black; also, a strong black line across from angle to angle. A square hole cut on the upper side of the cross line admits of anything against which it is placed being marked exactly at the height of that line. If the length of the edging intended to be levelled do not exceed 600 feet, let a rod be placed at each end, and the instrument half-way between these. Let an assistant hold the lozenge-shaped mark against the rod at one extremity of the line, whilst the person at the instrument directs him to slide it up or down, till the line across its centre coincides with the line of sight

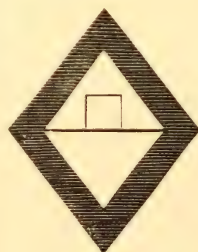


Fig. 796.

from the instrument when the bubble is in the middle of the spirit-tube. Mark the rod at the height of the cross-line; and in the same way the rod at the other end of the walk. The two points so marked on the rods at each extremity are in the same horizontal line, like the points mm , or ll , in fig. 795. The instrument may now be removed, and a rod put in its place. By placing the cross-line of the lozenge-slide on one of the points to which the level was directed, and then viewing from the point at the other extremity, the rod placed in the middle can be marked at a point which will be in a horizontal line with the other two. There will then be three ascertained points on the same level; and by viewing between any two, as many more may be marked along the line as may be found necessary. Thus, on the rods placed between the two extremities, a series of points may be

marked, all of which shall be in the same horizontal line. By measuring down a uniform distance from each of these points, the horizontal line which they marked may be transferred to the ground, or to the height to which the edging is to be worked. If this height be determined at any place, then it is only necessary to measure down to it from the level point originally marked on the rod, and to the same distance below each of the level points the whole edging should be formed.

If a border were to be made level across a piece of uneven ground, and so that neither more nor less soil shall be employed than that which is found within its limits, the following mode of proceeding may be adopted:—Place a rod at each end, and any number of intermediate rods at equal distances. Place the instrument near the middle of the length of the border, but not exactly in the direct line between the rods, in order that these may be seen without obstruction from end to end. Then mark points, in the manner before directed, at the same level on all the rods along the line. Now, as the ground was stated to be uneven, the level points will be at unequal heights above the surface, and the question is, to what uniform distance below them the surface, when levelled, will reach without having soil to wheel away as superfluous, or any to bring in to make up deficiencies. We shall suppose the number of rods placed along the line to be ten. Measure down from the level points to the surface of the ground. Then, from these perpendiculars, find the mean depth of the space between the horizontal line and the surface of the ground. This is accurately found by the following method:—To half the sum of the first and last perpendiculars add all the others, and divide the sum by their number, less 1; the quotient will be the mean depth of the space between the ground and horizontal line; and a line traced at that depth below the horizontal line will be the ground level to which, if the high parts are taken down, the soil from them will exactly fill the hollows. The following example shows the method of applying this simple rule. Suppose the distances from the ground to the level points marked on the ten rods are as in the accompanying table.

But cases may occur where the ground is so irregular that all the rods in the line cannot be seen from the same spot, and it may be required to find:

1. The difference of level between the extreme points.

	Ft.	Ins
Rod 1.....	4	6
„ 2.....	3	6
„ 3.....	3	0
„ 4.....	2	6
„ 5.....	3	0
„ 6.....	4	6
„ 7.....	5	0
„ 8.....	4	3
„ 9.....	4	0
„ 10.....	2	6
Sum of first and last divided by 2.....	3	6
Sum of the other depths.....	29	9
Number of depths, less 1 = 9.....	33	3
) 3 8½	

2. The height of a horizontal line, according to which the ground may be made perfectly level with its own soil.

3. The direction of a line, according to which the surface will form a uniform slope, with the least possible movement of soil.

1. To find the difference of level between the two extremities.—Place the rods A, B, C, &c. (fig. 797), at convenient distances, and so that the

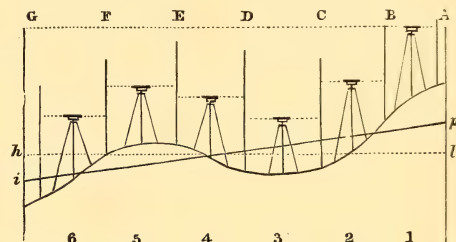


Fig. 797.

surface of the ground will be straight, or nearly so, between every two. The operation may be commenced at either end; here we shall proceed from A. Place the instrument half-way between A and B, mark the level points on these two rods, and enter their heights from the ground in columns as under. Thus, after directing the instrument back to rod A, the line of sight is found to intersect that rod at 3 feet from the ground; write that height in the column headed Back-sight. Then turning the sights of the instrument, and viewing forward to rod B, mark the level, and enter its height from the ground, 5 feet, in the column headed Fore-sight. Move the instrument to station 2. Take there the back-sight level to B, and the fore-sight one to C, and enter the heights of these level points in the proper columns. Proceed thus till the levels are taken at all the stations: then sum up both columns; their difference is the difference of level. If the sum of the heights in the back-

sight column be greater than that in the fore-sight one, the ground is rising; if the sum in the fore-sight column be the greater, the ground is falling, as is the case in the present instance.

Station.	Back-sight.	Fore-sight.	Distance of surface below horizontal line or datum, at
	Ft. Ins.	Ft. Ins.	Ft. Ins.
1.....	A, 3 0	B, 5 0	A, 3 0
2.....	B, 2 0	C, 5 6	B, 5 0
3.....	C, 3 6	D, 3 6	C, 8 6
4.....	D, 4 6	E, 3 0	D, 8 6
5.....	E, 4 0	F, 4 6	E, 7 0
6.....	F, 2 6	G, 5 6	F, 7 6
			G, 10 6
	19 6	27 0	
		19 6	
	Difference of level..... 7 6		

2. To find the height of a horizontal line *hl* (fig. 797), according to which the ground may be made level with its own soil.—Find the area of the perpendicular space between the surface of the ground and the horizontal line *AG*. Divide that area by the length of the horizontal line, and the quotient will be the distance from the line *AG* to a parallel horizontal line *hl*, according to which the ground will be level; for there will be as much of the solid ground above it as there are vacant spaces below it; so that when the heights are taken down to that line and turned into the hollows, the whole will be level. Supposing the rods are placed at the distance of 50 feet from each other, the areas of the spaces between each rod from the ground to the horizontal line *AG* should be found, in order to ascertain the area of the whole space. This can be done as follows:—

Perpendiculars, }	A, 3	B, 5.0	C, 8.5	D, 8.5	E, 7.0	F, 7.5	
	B, 5	C, 8.5	D, 8.5	E, 7.0	F, 7.5	G, 10.5	
Base,	8	13.5	17.0	15.5	14.5	18.0	
	50	50	50	50	50	50	50
	÷2)400	675	850	775	725	900	
Areas,	200	337.5	425	387.5	362.5	450	
The total of these areas is 2162.5 square feet.							

Now the object is, to find where a horizontal line can be drawn that will leave as much space or hollow below it as there will be of ground above it, or that will form the end of a parallelogram, the length of which is *AG* = 300 feet, and which shall contain an area equal to that of the whole space above ground, up to the line *AG*, or 2162.5 square feet. If it do the one it will certainly do the other; for a line that will include all the clear space above it, must exactly leave that which is, or ought to be made, solid ground below it. We may therefore divide the area of

the space by the length, and it will give the breadth of the parallelogram, or average perpendicular distance from the datum line to the surface of the ground. The total area of the irregular space is, as above found, 2162.5 square feet, which, divided by 300, the length, gives 7.208 feet, or about 7 feet 2½ inches, and this distance, measured down from the datum horizontal line *AG*, will determine the position of the required horizontal ground line *hl*.

In the above example, the rods are at equal distances, and this being the case, the mean distance from the datum line to the ground could be found by merely adding to the half sum of the first and last perpendiculars all the others, and dividing this sum by the number of perpendiculars, less one; thus—

$$\frac{3+10.5+5+8.5+8.5+7+7.5}{2}=43.25,$$

which, divided by 6, the number of perpendiculars, less 1, gives 7.208, or 7 feet 2½ inches, as before. But cases may occur where the rods, to give the correct area, must be placed at unequal distances, so as to be at the extremities of the different slopes, and then the mean perpendicular distance cannot be obtained by averaging the respective heights, but must be calculated by multiplying the sum of each pair of perpendiculars by the distance between them, and taking half the product for the area; or the sum of any pair of perpendiculars multiplied by half the distance, or half the sum of the perpendiculars by the whole distance between them, will, in either case, give the area of space included between the two perpendiculars. The rods, as before remarked, should be placed so as the surface of the ground will deviate little from a straight line between every two, or, in other words, at the highest and lowest parts of the surface.

Thus, however irregular the surface may be, levels can be taken on the rods, so that the distance from the ground to a horizontal datum line can be found at any point, and consequently the area of the whole space or section between that line and the ground can be ascertained. This area, divided by the whole base or distance between the rods placed at the extremities, will give the distance of the level ground line from the horizontal datum line. Here it may be observed that the centre of this ground level remains at the same height, although the ground may be laid to any slope. A border the length of the

above line, 300 feet, may be perfectly level; and if three stakes, one at each end, and one exactly in the middle, are driven in till their tops are level with the ground, as where the lines intersect the rod D, the ground may be laid sloping, by lowering one end below the level, and raising the other as much above it, so that the top of the stake at one end shall then be, say, 1 foot above the ground, and the other 1 foot below it; still the top of the middle stake will be, as formerly, level with the surface, just as a plank supported at its middle between two fixed points may be placed horizontally, or more or less sloping, but the point at the centre will always retain the same position.

3. To find the direction of a line according to which the surface will form a regularly inclined plane or uniform shape, with the least possible movement of soil.—Instead of the ground being made perfectly level by the line hl (fig. 797), let it be laid sloping with its own soil by a line ip . Place a rod at each extremity, A G, and one exactly in the middle, at D. Find a line that will correspond with the horizontal level of the ground between A and D, and another for the space between D and G. These lines may be found in a similar manner to that by which the line hl was found. Here the total area of the spaces between A and D is $200 + 337.5 + 425 = 962.5$ square feet. This, divided by the length of base between A and D, 150 feet, gives about 6 feet 5 inches to be measured down from the datum line A G for the horizontal level of the *upper half* of the ground. The areas of the spaces between D and G are 387.5, 362.5, 450; and their sum, 1200, divided by 150, gives 8, the number of feet to be measured down from the line A G for the horizontal level of the *lower half* of the ground. This is 1 foot 7 inches below the level of the other half. The mean between these levels gives the position of the horizontal line hl of the whole piece.

Now, whether the surface is reduced to a horizontal level, or whether it is laid sloping, the point in the middle of the horizontal ground line always retains the same position, the same distance from the datum line A G, and it is always at the surface of the ground, whether this be level or formed with a uniform slope. The mean level of both the upper and the lower half of the ground having been ascertained, also the general level of the ground hl , the central point at the intersection of the rod D must always be in the surface plane, whatever the

inclination of this may be. On this point as a centre the line hl may have one end elevated to any required extent, whilst the other is equally depressed; and still the ground will suffice to level itself to that slope.

But the question is, how to determine the amount of slope so as to have the least possible quantity of soil to move. This can be done by a line drawn through the centre of the mean higher and lower levels, and such line will also pass through the centre of the general level. The same will be effected by setting up the difference of height between the higher and lower levels from l and down from h , marking the points $i p$, a straight line between which will give the direction of an inclined plane, requiring less moving of soil to form it than would be the case with any other; and at the same time the ground will not have to be moved to so great a depth in certain places as if a horizontal plane were formed. These are important objects; for, with reference to fig. 797, supposing the ground were to be reduced to a level, and that the portion of bank between A and B extended 200 feet, in that case 2670 cubic yards would have to be moved, partly into the adjoining hollow, and partly to the distance of upwards of 200 feet to the hollow between F and G. But by the slope ascertained to be best, the removal of as much as 487 cubic yards is saved, as well as the distant carriage. If the ground were required to be taken down to the level, the depth to be cut down from the surface to l would be 4 feet $2\frac{1}{4}$ inches. At that depth solid rock might be met with; but by adopting a slope, the cutting would be reduced to 2 feet $7\frac{1}{4}$ inches.

Where the subsoil is as easily penetrated in one place as another, and where the surface has to be made of one uniform slope at the least expense, proceed in the following manner:—

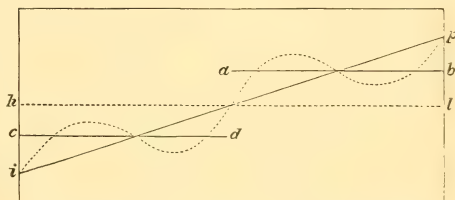


Fig. 798.—Levelling.

Find the mean levels of the upper and lower halves, as ab and cd (fig. 798), and the difference of their heights, ad , say 4 feet. Half the difference marks the position of hl , indicating the mean level of the whole piece.

Measure up 4 feet from l to p , and down from h to i ; the line ip will correspond with a slope requiring a less amount of labour than any other to reduce the undulating surface, represented by the dotted line, to a uniform inclined plane. It will be observed that the rising ground opposite a has only to be turned into the hollow at b , and the projection at c will suffice to make up the adjoining deficiencies near d ; and with these two simple operations the work is completed. If a steeper slope were to be adopted, it is evident that a quantity of soil would have to be moved uphill from near i towards p . If, on the contrary, the slope were to be made less than that represented in the figure, more than the minimum quantity of soil must be moved, although easier, of course, than in the other case, because downhill.

Hitherto the directions have been given for levelling a line, such as the edging of a walk, or a strip like a border, which, although sloping irregularly in the direction of its length, was supposed to be all along horizontal across. If those directions are well understood, there will be less difficulty in comprehending a more complicated part of the subject, which must now be entered into.

If the ground undulates with a general slope in one direction, say from north to south, and if it does so regularly across the whole area, the instructions already given will be sufficient; but it may also slope irregularly in other directions, so that neither the perfect level nor the general uniform slope of the least expensive formation can be so easily determined.

The substratum should be so regulated as to be a certain distance below the surface, namely, the estimated average thickness of the top-soil. The soil and subsoil may be worked accordingly, but both too high. By reducing the surface to the proper level, the depth of good soil, so far as the reduction goes, will be less than it ought to be, unless the substratum be also lowered. In order that such unsatisfactory and expensive labour may be saved, due care should be taken to ascertain the proper average level of the whole ground. In order to do this it is necessary to find at some convenient height a number of points in the same horizontal plane, so that from these the average depth of the space between that plane and the surface of the ground can be ascertained. Place a rod at each corner, as a, b, c, d (fig. 799), and, taking care to place the instrument half-way between the rods, in case of error from the line

of sight not being exactly parallel with the axis of the spirit-tube, mark level points on the rods, say a and b , move the instrument to one of the adjacent sides, as between b and d , and mark similar points on each of them. Now, it will rarely happen that the marks on the rods taken from station f will correspond with those taken at station g . The difference, however, whether higher or lower, will be seen on the rod b . If

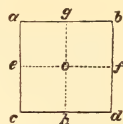


Fig. 799.

it be, say, 10 inches lower, then mark 10 inches above the level point on the rod d , and this mark will correspond with the levels first taken between a and b . Proceed in the same manner with the levels between dc and ca , and thus

four points, one at each corner of the ground, will be obtained in the same horizontal plane. If the ground is not very irregular, place rods at equal distances in line from end to end and across, so as to form the whole into squares, and by viewing from the level points at the corners, as from a to b , mark others on the rods placed intermediately along that line, and likewise on the rods on the opposite side, between c and d ; and by viewing between each pair of opposite rods on these sides, the whole of the rods can be marked to the same level. Then, by the preceding rules, find the mean perpendicular of the space between the ground and the horizontal line on the side ab . Mark this down; and in a similar manner the mean of the next parallel line of stakes, and of all the other lines running in the same direction. Add the mean height of the line ab to that of cd , and to half the sum add the means of the heights of all the intermediate ones; divide the sum by the total number of rows of stakes, less 1, and the quotient will be the distance to be measured down from the level mark on each rod for the mean level of the ground.

After due consideration of the foregoing directions and examples, with a little practice, anyone may understand how to level sufficiently well for garden purposes. The best instrument for speed and accuracy in taking levels is a well-made Dumpy's Level, and everyone who has a garden, or any other important piece of ground to level and lay out, ought to possess that handy and accurate instrument. Some may raise objection to its cost, but it soon repays itself in saving time and extra work; and if the first cost is considered too much for the job to bear, it can at least be hired for a trifling sum, which is generally saved in a single day's work.

Another useful instrument can always be found in an ordinary plummet level, as used by builders, and the levels can be carried on with it, from rod to rod, correctly enough, if proper care be taken, although not nearly so expeditiously nor so accurately as by Dumpy's Level. But it is better that some time should be occupied, even by this tedious process with a plummet level, than to commence operations at random, judging merely by the eye; for this, where the ground is very irregular, often proves very deceptive.

Workmen may be set to lower the parts that are too high, and to make up those that are too low; but in doing this they cannot know how much the one part should be taken down, or how much the other should be raised. They may, however, contrive to bring a height and its adjoining hollow to a tolerably fair level; by successive lowerings the height is at last reduced, and a uniform surface appears instead of the original height and hollow. After due pains have been taken to smooth this portion, the next height and hollow can be treated in a similar manner; but when this is done, in all probability the two portions thus levelled will not agree; means must therefore be employed to make them do so. The carefully smoothed surface of the highest portion must be broken up; third and fourth portions can then be brought to a level with the two first; still it may be questionable whether all may not have to be altered, in order to agree with the remaining portions of the ground. This is as likely as not, for it is all chance work.

One cannot set to work by chance with much confidence; he is always in danger of going too deep or too shallow, and of having to undo what he has done. He cannot tell, in fact, when or at what cost the work will be accomplished. It is very different when levels have been taken; the workman, in taking down a portion that is too high, knows by the marks on the adjoining rods how deep to go in lowering, and how high in making up, and he can then work freely, without hesitation or fear of going wrong. If ground be only worked roughly to the level marks in the first instance, still it will be found that a digging will render the whole surface perfectly satisfactory. Without knowing how to level, neither draining, trenching, nor other ground work can be well, and at the same time economically, performed.

Figs. 801 and 802 show how slopes or undulating ground may be treated so as to render them most suitable for the cultivation of fruit and vegetables.

DRAINING.

We have treated at considerable length on the subject of levelling, because its importance, in many garden operations, renders a knowledge of it very desirable. We may now proceed with draining, an operation which should precede that of trenching and other ground work, but which ought not to be commenced until the level of the ground has been determined.

The beneficial effects of draining have been noticed under the improvement of soils, and matters more immediately connected with its practical application have now to be considered.

The necessity of draining is naturally the first question, for it would only be a waste of money to drain a garden that is either naturally too dry, or one that, on examination, is found to possess no superfluous moisture. Where the strata are of the character and arrangement shown in fig. 800 little or no arti-



Fig. 800.

ficial draining will be required. It is generally not difficult to decide at any time in the case of ground being too dry. Occasionally, however, the soil may be of a dry, open nature, and yet prove in certain seasons too wet below for the roots of fruit-trees. In this case the subsoil is usually of a very impervious nature, and lower than the high-water level of the channel which receives the drainage of the garden and its vicinity. The height to which the water rises in the channels after heavy rains can be ascertained either from actual observation or from the water-worn marks; and by taking the level from these to the garden, the height to which the temporary stagnant water will rise can be known. If the water only rises too high occasionally after heavy rains—if the rise is the exception and not the rule—the trees may thrive very well. But if it stands too high for a considerable part of the year, then it ought to be drained, if possible.

The site of a garden may be perfectly level,

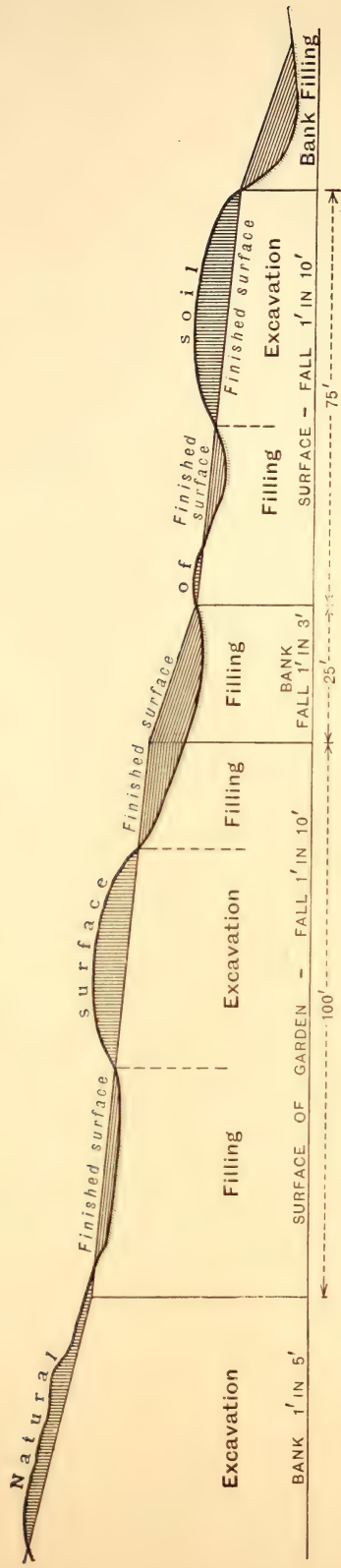


Fig. 801.—Method of dealing with an Undulating Slope.

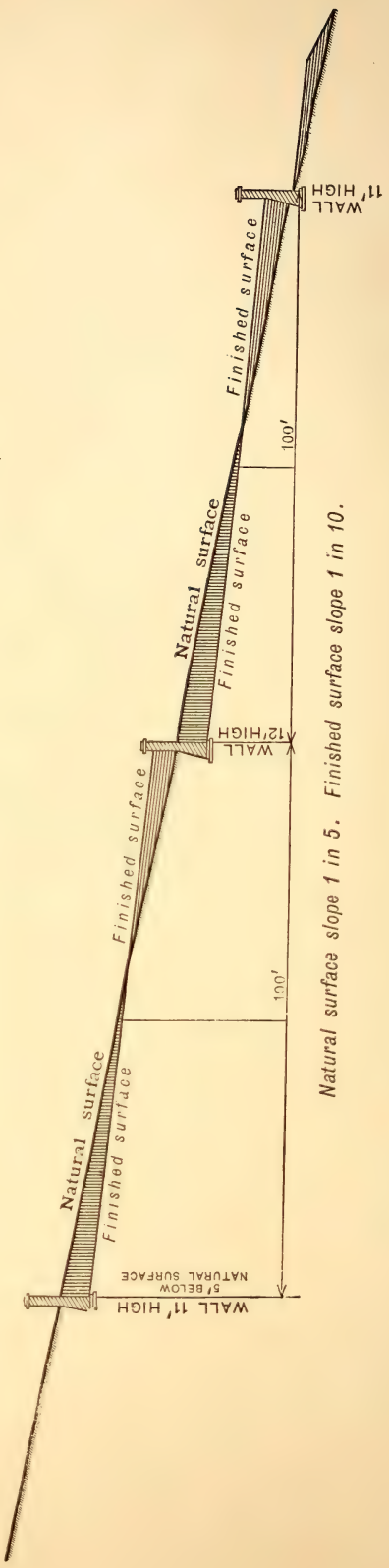


Fig. 802.—Method of dealing with a Slope facing South; Walls to be used for Fruit-trees.

and at the same time naturally well drained. Where there is a good top-soil on a loamy sub-soil, and this again on gravel conducting to a considerably lower channel, no artificial drainage will be required. The worms will perforate the stratum of loam, even if it should be 2 feet deep to the gravel, and by means of their runs the surface water readily passes down—sometimes, indeed, too readily. Under such circumstances, where the mean temperature of the year is about 50° , and the annual amount of rain only 24 inches, fruit-trees will frequently suffer from dryness at the roots, and therefore ground so situated does not require drainage. Ground lying on a slope with an impervious subsoil, although free from springs, may yet be too wet in certain parts; for where the slope is irregular water may collect in the hollows. But when the subsoil is reduced to a regular slope, and these inequalities removed, the rain-water will not lodge in one place more than in another, and in all probability there will be no necessity for drainage. In short, where the subsoil has, either naturally or artificially, a regular slope, and where no water reaches it, beyond the rain which falls on the area, draining will not be required, except in climates where the average rainfall exceeds 30 inches in the year.

With a uniform, and, it may be, only a slight descent to a lower level, a moderately porous soil, even in a wet climate, may not be in want of artificial drainage; and, on the other hand, ground may be so circumstanced as to be absolutely unfit for crops until it be drained, although the depth of the annual rainfall may be comparatively small. Whether, therefore, a soil requires draining or not depends much more upon its nature and other circumstances than upon the quantity of rain which falls on the spot.

The ground in this country being very irregular, the surplus water is conveyed to the ocean by streams and rivers. In some cases these natural channels may require deepening, but in general they can be looked upon as affording sufficient fall for the drainage of the adjoining ground.

Fig. 803 represents a tract of undulating ground, a large portion of which rests on a porous subsoil, as from B to C, whilst from A to B and C to D are marshy, from the rain which falls on these portions not escaping; and it will be observed that the portion from A to B receives also the water which drains through the subsoil between B and C.

Occasionally the strata are disposed in the form of a basin, as in fig. 804. The rain which falls at A and B percolates towards the centre,

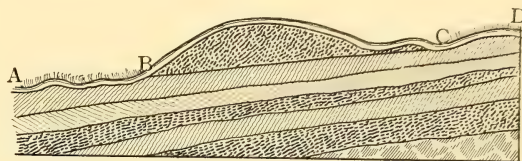


Fig. 803.

and the water may force its way through the thinner part of the mass of clay, as at D; by boring at C an artesian well would be obtained.

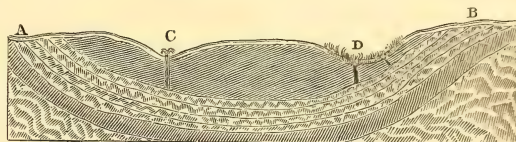


Fig. 804.

Fig. 805 also represents porous subsoil, in which the water is confined by layers of clay, except when it forces passages, or springs, from

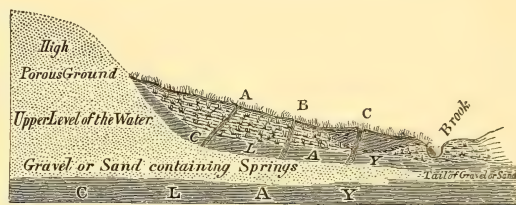


Fig. 805.

its pressure, through the upper layer, as at A, B, C.

In some clay soils a bed of sand or gravel, completely saturated with water, occurs at the depth of a few feet below the surface, with which it has corresponding undulations; but in places where its water is subjected to the greatest pressure, and the stratum of clay above it offers the least resistance, springs from



Fig. 806.

it appear at the surface, or it saturates the soil so as to render it only fit for subaquatic vegetation. Fig. 806 exhibits this arrangement of strata: where A represents the surface soil; B, the impervious clayey subsoil; C, the watery stratum of sandy clay or gravel; D, the lower bed of clay resting upon the rocky strata; E

and F, springs. Supposing the lowest portion of the stratum C, or that between E and F, to be 4 feet lower than the highest part of the curve on each side of it, then when the whole is completely saturated, the upward pressure between E and F will be equal to about 250 lbs. on the square foot.

Some rocky strata, impervious to water, are interrupted by fissures, as represented at A B (fig. 807), which are called *faults* by miners.

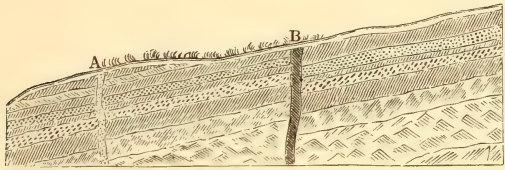


Fig. 807.

Some of these fissures are occupied by substances which obstruct the passage of water, others with those of a porous nature. Let A represent a sandy stratum, B a clay one, and C and D porous strata charged with water; on reaching the fault at B, the water will collect, and rising upwards so as to form a spring at the surface, it will render the soil between B and A too wet. The water, however, on reaching the sandy fault at A, will pass down through it to the porous strata, which, before the disruptions at A and B, had been continuations of the strata C, D

It will be observed that the strata are sometimes as irregular as the surface, but this is not generally the case. On the contrary, they mostly form inclined planes, so that when we once get trace of a watery stratum, and can ascertain the ratio of its slope, its depth from the surface at any point so far as it extends, and the place where it crops out to the surface, can be pretty well determined.

We must endeavour, in the first place, to find the direction of the greatest slope or inclination of the stratum. This may be done by digging down to it in three places, as at A, B, D (fig. 808), their position being such as to form three angles of a square. Then find the relative levels of watery strata at these three points. If D be the lowest, and A and B be on the same level, the slope of the stratum is direct from A B to C D. If B is the highest, and A and D equally lower, the greatest slope will be from B to C, crossing the diagonal at right angles in O. If B is the highest, A lower, and D the

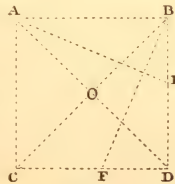


Fig. 808.

lowest, then the line of greatest slope will be through some point between O and D. To find this point, divide the line A D in proportion to the slopes of A B and B D. Let that of the former be 8 inches, and that of the latter 20 inches. Suppose the line A D is 226 feet 2 inches in length, and divided in the proportion of 8 to 20, it will give 64 feet 7 inches as the less, and 161 feet 7 inches as the greater portion. It is evident that the greatest fall will be nearer D than A; therefore the greater proportion set off from A to D, or the less from D to A, will mark the point through which the line of greatest slope, B F, intersects the line A D. Or, as the difference of level between B and D is to the distance between these points, so is the difference of level between A and B to the distance from B towards D, where the stratum will be at the same level as at A. Stretch a line from A to the point thus ascertained between B and D, and a line across it anywhere at right angles will indicate the direction of the greatest inclination of the stratum.

Suppose that from B to A there is a fall of 8 inches, and from B to D 20 inches, and that the side of the square from B to D is 160 feet; then as 20 inches : 8 inches :: 160 feet : 64 feet. At the distance, then, of 64 feet, from B to E, the stratum will have declined 8 inches, or as much as from B to A; consequently A and E will be on exactly the same level, and a line drawn between them will be at right angles to the line of greatest declivity. Accordingly, a line B F, stretched from B and across A E at right angles, will indicate the greatest inclination along this line.

The depth of the strata below B should be ascertained at say 50, 100, 200 feet or yards apart, noting the difference between each and that at B, in order to know the ratio of its slope per 100 feet or yards. If it slope, for instance, 6 inches in 100 feet, it is easy to find the amount per 1000 or any other number, so that at any point the depth below the starting-point can be calculated.

To ascertain the depth of the stratum at say 800 feet from B:—Find the depth of the stratum at that distance, which, presuming that it slopes 6 inches in 100 feet, would be 4 feet; also, how much the surface at that distance is higher or lower than the surface at B; and let it be supposed that at the latter it is 3 feet above the stratum. If at the distance of 800 feet the surface is found to be 4 feet lower than at B, then it will have sloped just as much

as the stratum, and of course will be, as at the origin of the investigation, 3 feet above it. If on the same level as at B, then the stratum, having in the interval sloped 4 feet, will be 7 feet from the surface; and if the latter is 2 feet higher than at B, it will be 9 feet from the stratum. If, on the contrary, the surface of the ground fall as much as 7 feet, it will meet the course of the stratum, which will then, as it is termed, *crop out*, as is the case with the porous stratum C (fig. 803), after passing under the elevated ground which intervenes between C and A.

Spring water, conveyed to a distance through such porous channels as those to which we have referred, cannot be too much guarded against, as it may render the latter not only wet, but too cold in summer for most kinds of garden plants. A slope may face the south, and be warmed by the sun, but this will be to little purpose if the roots are constantly chilled with cold spring water. In some places the temperature of well-drained land in the spring-time is probably not higher than that of spring water; but as the season advances, and the air temperature rises, so does that of the soil. But where affected by springs, the temperature of the soil does not rise in accordance with the increasing summer heat, and under such conditions vegetation cannot prosper.

Various kinds of drains are formed to suit different circumstances; they are either *open* or *covered*.

Open Drains.—The open drain, or ditch, was doubtless the original mode of draining off superfluous moisture, but it is now generally superseded by covered drains. These economize the ground and they are usually the cheapest, open drains being apt to break down at the sides, and fill up with weeds, so that much expense for frequent scouring is incurred. In their usual form, moreover, open drains or ditches in or near gardens are unsightly. If they are in any case admitted, they should

be made in the form of ornamental water-courses and utilized for water- and bog-plants. A garden with such a system of drainage is shown in fig. 809.

Covered Drains.—Some of these are formed by cutting out a narrow trench and making the bottom still more narrow, so that, when a thick turf is put in, a cavity for the water is left at

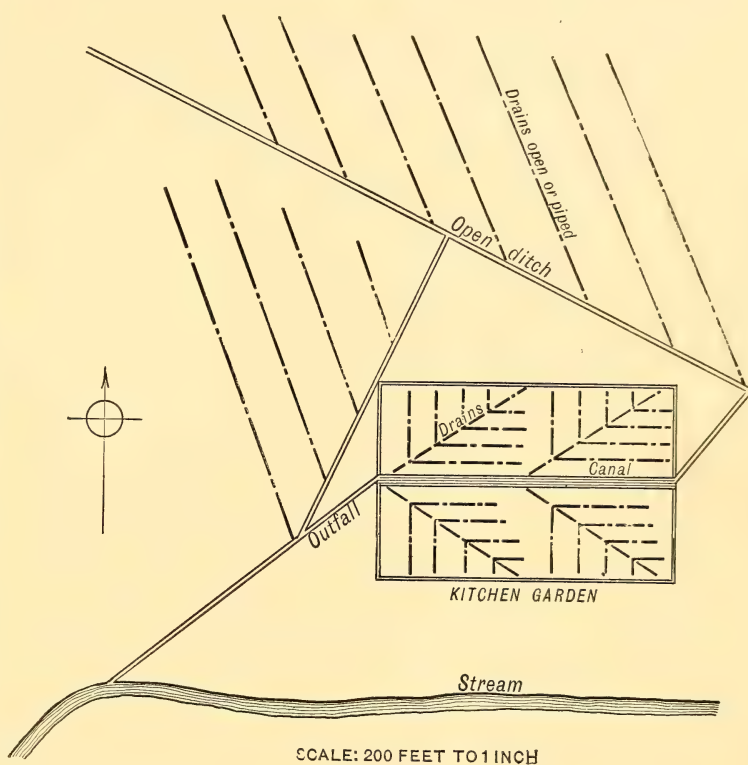


Fig. 809.—Site for Kitchen-Garden where there is rising wet ground north of site. The plan for drainage shows how surface water is prevented from entering kitchen-garden. The drains are conducted to centre of garden to form a wide open ditch or canal suitable for irrigation and the culture of Aquatic and Bog Plants. The kitchen-garden is also drained into canal. Example of such a centre canal is at Criche, Dorsetshire.

the bottom; while others are filled up with fagots. It is needless, however, to notice these particularly, as stone or tile drains are so much superior to them.

Where suitable stones are plentiful they should be used for the purpose of draining; and drain tiles or pipes can be obtained of any desirable shape, and at a reasonable rate, owing to the improved machinery employed in their manufacture. In some cases it is desirable to construct stone-drains, in order to get rid of stones taken out of the ground in trenching it to the proper depth. They can be made to act perfectly; but they may, like most kinds of drains, get stopped; and when this occurs they cannot be so easily taken up and relaid as tile- or pipe-drains, owing to the wedging of the

materials, and their greater weight as compared with that of tiles. There are three kinds of stone-drains: the *box-drain*, the *couple-drain*, and the *small-stone or rubble drain*.

The *box-drain* (fig. 810) is chiefly formed with flat stones. Drains of this kind have to be carefully built by the hand, and are proportionately costly, but if well built and filled up with a foot of small stones or rubble on the top of the covers, they act effectively, and will last for ages. For permanent work they are worth their cost. They are made by selecting the largest and flattest stones for soles and covers. Great care must be taken to lay the upper face of the soles perfectly even, so that no part of a bottom stone rises half an inch above the general run, which can be ascertained by placing a straight-edge along their face. The bottom being thus made flat and fairly smooth to prevent obstruction and facilitate the flow of water, the sides are built to the required height, packing the smaller stones neatly in between the larger ones to keep them firm and steady in their position. The covers are then laid on, taking care to place their flattest

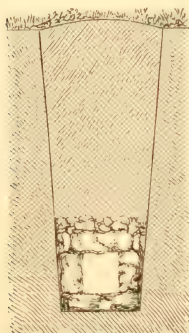


Fig. 810.

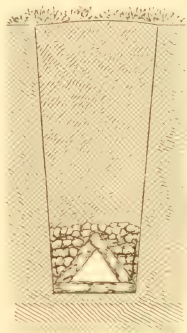


Fig. 811.

sides downwards, so that there may be no projections into the cavity. Small stones are then put over the covers to a depth of from 9 inches to a foot, and a layer of turf or other tough substance should be placed over the stones in order to prevent the soil from mixing with them. If 3 inches in depth of coal-ashes can be laid over the stones they will prevent worms working down and interfering with the drainage.

The *couple-drain* (fig. 811) is formed by putting flat stones on the bottom for a sole, and upon this two other stones are placed, with their upper edges leaning against each other, so as to form a triangular cavity. The spaces between the sides of the drain and those of the cut trench may be filled up with smaller stones, and precau-

tions similar to those employed in the preceding case are necessary to prevent the soil from closing up the drainage.

Figs. 812 and 813 represent sections of small-stone or rubble drains. They are 7 inches wide

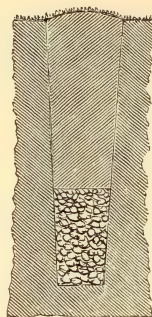


Fig. 812.

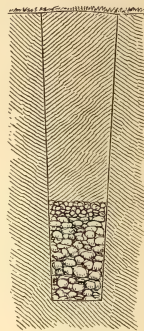


Fig. 813.

at bottom, and 9 inches wide at the top of the stones, the depth of the latter being 15 inches. These are the ordinary proportions, and make a good drain. The stones should pass through a 3-inch ring; and rounded land- or water-worn stones are better than broken rock or stones with flat sides and sharp angles. It is a good plan to put a layer of very small stones, several inches thick, over the others, as represented in fig. 813; for by so doing, the earth is prevented from passing down so readily among the lower portions of the drainage. Rubble drains are not so well adapted for gardens as box-drains; for rich soil, such as that of gardens, usually abounds in earth-worms, by the workings of which the drains are apt to be compactly cemented. They may, however, be adopted with advantage in some cases; for example, an orchard may require a certain amount of drainage when the trees are first planted; but when they get large, it is frequently the case that they require all the moisture they can get; so that if the rubble drains cease to act after the lapse of some years, the want of drainage will not be felt.

Tile-drains.—There are several kinds of these. Fig. 814 represents the common horse-shoe tile



Fig. 814.

and its sole. The latter is sometimes dispensed with, but this is bad economy, because in most subsoils the bottom of the drain becomes soft, and allows the horse-shoe tiles to sink, diminishing the opening not only by the amount of

sinking, but likewise rendering it liable to be completely choked up. If from any cause one tile should sink and those next to it should not, there will be an opening at the top through which soil will fall and in time choke the drain. This cannot take place where soles are used, especially if care be taken to place the horse-shoe tiles so as to break bond, that is, to rest on two adjoining soles, as they are represented in fig. 814. The sole tile should be carefully bedded, so that when pressed it may be quite flat. Some fibrous materials, or small stones if they are at hand, should be placed over the tiles before the earth is filled in. Fig. 815 represents a section of the finished drain.

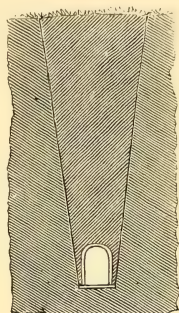


Fig. 815.

Pipe-drains.—Experience has proved these to be the best and cheapest of all drains, and consequently pipes in some form or other are now almost exclusively in use for land drainage. They are made of different shapes, but chiefly cylindrical, as in fig. 816, for the draining of



Fig. 816.

land. The cylindrical form is found, on the whole, to be the best for the purpose. It can be laid with the greatest facility, and it retains its position better than the oval form, especially when the trench is properly cut out.

The width of the trenches should be just sufficient for a man to work in. In clay soils, when the trench is cut to within 9 inches or a foot of the intended depth, the bottoming

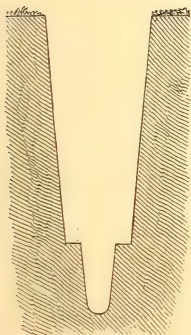


Fig. 817.

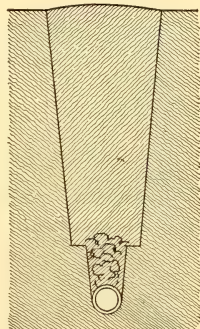


Fig. 818.

tools should be employed to cut out a groove merely wide enough for the reception of the pipe, as in fig. 817. In loose gravelly or

stony subsoils it may not be possible to cut a narrow groove so deep as 9 or more inches, but a depth equal to the diameter of the pipe should at least be grooved out, so that the pipes may bed in the solid ground as accurately as possible. Fig. 818 is a section of the finished pipe-drain, with 9 inches of small stones or rough ashes over the pipes, a method that should always be employed in draining garden ground.

Drain-pipes are sometimes furnished with *collars*, as represented in fig. 819. These collars should be employed in draining gardens, as they not only tend to keep the pipes from shifting, and thus interrupting the continuous flow of the water, but they also prevent roots from insinuating themselves into the drains. The size of the pipes, or width of their bore, depends on the quantity of water which



Fig. 819.

has to be carried off. With regard to the length of the drain, it is easily understood that if pipes of a certain capacity are necessary for a certain length of drain, and if that length be increased, the capacity of the pipes, or at least of those towards the lower end, must also be increased. In all cases, however, it is well to make sure of ample capacity for drawing off all superfluous water that may at any time collect.

Generally pipes of an inch bore in drains 24 feet asunder have proved to be more than adequate to discharge in forty-eight hours the superfluous water produced by the heaviest rains which occur in this country, provided that the pipes are all in good working order; but after a time it must be expected that obstacles to the free passage of water through the pipes will arise, in consequence of which many of them will have the bore partially, and some of them entirely, filled up. It is therefore advisable in gardens, where there is generally a difficulty in relaying the pipes in consequence of trees, to use tiles or pipes of ample capacity. 3-inch pipes are a fair average size, laid even and close, with 9 inches of rubble over them.

Figs. 820 to 824 represent various modes of forming main drains, one or other of which may be adopted according to circumstances. Fig. 820 is a combination of two horse-shoe tiles, with a tile-sole or slate between them. In many cases the lower end of a drain may so

be formed, whilst the single tile (fig. 821) may be sufficient for more or less of the upper part. Fig. 822 is similar to fig. 820, but pipes are used instead of tiles, and when covered with 9 inches or more of small rubble are much the best form of small drains for a garden. Fig. 823 is well adapted for a main drain, as it allows a large quantity of water to pass. The same may be said of the arrangement seen in fig. 824, which affords a chance that if roots get into one or even two of the openings, still the third may be clear to act.

Depth of Drains.—In many cases the depth of the drains is limited by the outlet. Where this allows of a sufficient fall, the top of the materials forming the drain should not be less than 3 feet below the surface, in order that they may not interfere with deep trenching, and that they may be further removed from the danger of getting choked by the roots of plants. Circumstances may render it desirable that the drains should be cut to a depth of 4 feet.

Distance apart of Drains.—The distance at

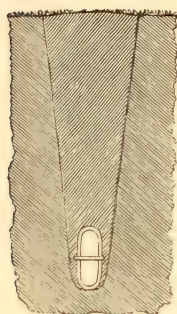


Fig. 820.

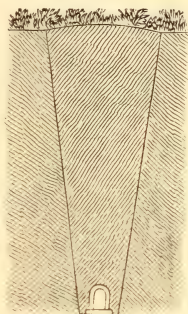


Fig. 821.

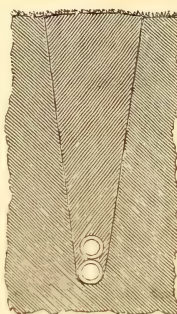


Fig. 822.

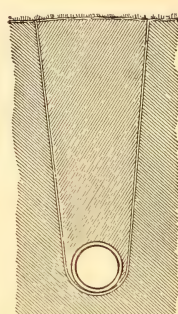


Fig. 823.

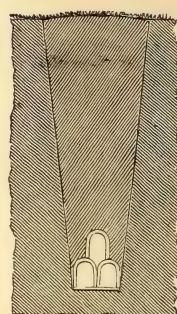


Fig. 824.

which drains should be formed depends on various circumstances; chiefly upon the porosity of the soil or subsoil. In stiff tenacious soils the drains will require to be from 3 to 5 yards apart, but in lighter soils they will draw well at 6 to 8 yards asunder. If the depth of the drains is 4 feet, and they are laid the above distances apart, according to the tenacity or porosity of the soil, they will generally afford perfect drainage.

Direction of Drains.—In level ground the direction of the drain is, of course, determined by the outlet, or by a main drain communicating with some place of outfall. Where there are no springs, and only the superfluous water of a wet climate has to be drawn off, the drains should run in the direction of the slope of the ground, or slightly diagonal with it. If a watery stratum, causing springs, has to be intercepted by a deep drain, it ought to be cut more or less oblique to the direction of the stratum; for by crossing the slope of the stratum at right angles, the drain would probably be level; or, if cut so as to have a fall, part of its extent will be under the stratum.

In commencing the operation of cutting drains, the outlets of the main drain should be, if the declivity will permit, several inches above the surface level of the water in the channel of outfall. Drains on different sides of the same channel of outfall should not enter it exactly

opposite each other, nor should any drain be led into the outfall, or into another drain, at right angles. Although the general direction of drains will often be at right angles to the channel into which their water is discharged, yet on approaching it they should form a gentle curve in the direction of the stream or main drain, so as to enter it at an acute angle. In this way the two streams will unite and clear away the mud that would otherwise accumulate at the mouth of the drain.

The small drains should have as much as 3 inches of a fall into the larger or main drains; and more than this, for the general outfall, would be desirable. It is a bad plan to terminate the minor drains in an open ditch, as they are apt to get choked. They should therefore be made to fall into main drains, from which the water will be discharged with greater force, and thus keep their outlets clear.

The main drains should be cut first. Then, as soon as the lateral drains are cut, they should be immediately laid, commencing the laying at the top of the drain, or the place farthest from the outfall, and terminating in the main drain, with which each junction should be carefully made. If the main consist of tile-pipes, there should be branched ones for the junctions; or if not, a hole should be cut out in the side of a main pipe, into which the terminating pipe of the lateral drain ought to be neatly fitted.

When the first drain is laid into the main, the latter should be laid as far as the entrance of the next lateral drain, and thus the work should proceed till the whole is completed to the place of outfall.

The beneficial effects of drainage greatly depend on a law of nature, which horticulturists should particularly bear in mind. It is a well-known natural law that water is at its greatest density, or heaviest, when its temperature is about 40° Fahrenheit. Consequently, in any body of water, that portion which is nearest 40° in temperature will sink to the bottom, while the warmer will rise and float over it. The heaviest water always occupies the lowest position, and will maintain it to the exclusion of the warmer and lighter water, unless disturbed by force. The main art and use of drainage is therefore to withdraw this cold and heavy portion, so that the warm summer rains may sink down and occupy the place of heavy stagnant water derived from cold winter rains or melted snow, which cools the soil and chills vegetation.

The reader should consult the chapter on TOOLS AND IMPLEMENTS for information as to the tools required in the work of drain-construction.

BORDERS FOR FRUIT-TREES.

In some cases the soil of a kitchen-garden is so good that the fruit-tree borders require nothing beyond trenching and manuring, in common with the rest of the ground. But frequently more than this is necessary. The soil may have to be removed, and a better substituted. Occasionally it may be found necessary to remove the subsoil also to a certain depth. From these considerations it will be seen that the formation of the borders should precede the trenching of the rest of the ground.

Width of Fruit-tree Borders.—As a general rule it has been stated that the width of the borders should be equal to the height of the walls; but this rule should not be implicitly followed in every case. The walls of the royal gardens at Frogmore are all 12 feet high, but some of the borders are 15 feet, others 18 feet wide, a greater width being allowed to borders for Pears than those for Peaches and Nectarines, because the roots of the former extend farther than those of the latter. The principal consideration is the extent of border necessary for affording the roots sufficient nourishment. This partly depends on the nature of the soil, subsoil, and the situation. If the soil is rich, it will contain more nourish-

ment in less compass than where the soil is of a poorer nature. If the subsoil is bad, and the situation cold, then the borders should be made wide, so that the roots may be encouraged to extend outwards rather than downwards. As borders can be cropped, it may be urged that there can be no loss of produce by making them broader than the trees require. For the growth of certain vegetables borders are preferable; but there are others that require the ground to be trenched occasionally, and this cannot be done when the border is occupied with the roots of fruit-trees.

A fruit and kitchen garden of the extent of 1 acre, or less, may have the borders 12 feet wide. If the garden contain 2 acres, the borders may be 15 feet; and if more than 2 acres, they may be 18 feet wide, which is the greatest width that any fruit-tree border need be formed under any circumstances.

Depth of Fruit-tree Borders.—There is much difference of opinion with respect to the depth of fruit-tree borders. The range of depths recommended may be said to extend from 15 inches to 3 feet. Shallow borders are advocated on account of their maintaining the roots near the surface, and consequently more within the ameliorating influences of the sun and air.

The advantages of the air being able to reach the roots of fruit-trees through an open friable soil, in which the roots run at a comparatively shallow depth, say 9 to 15 inches, are now well known to every successful fruit-grower, these being the roots upon which the crop of fruit mainly, if not wholly, depends.

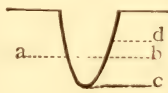
Presuming that the soil is a good loam, but the climate not first-rate, a depth of not more than 2½ feet is ample; and in a climate still less favourable, the depth may be reduced to 2 feet; or, if the subsoil as well as the climate is cold, 18 inches in depth will be sufficient. As borders are usually formed with a slope from the wall to the edge of the walk, and as this slope is generally greater than that of the bottom of the border, it follows that the depth of soil will be greater at the wall than at the side of the border next the walk. The several depths above-mentioned are to be understood as *mean depths*; thus, where the depth of soil is recommended to be 2 feet, that will be the depth about half-way between the wall and the side of the border next the walk.

The bottom of fruit-tree borders should have a regular slope from the wall towards the walk, where drainage should be provided. The amount of the fall depends on the width of the border.

In general, a fall of half an inch in a foot is quite sufficient. This amounts to 6 inches for a border 12 feet wide; and 9 inches for 18 feet wide.

The amount of slope to be calculated for the surface of the borders is more dependent on circumstances than that of the bottom. In localities where the climate is good, and where the average quantity of rain does not exceed 24 inches, the surface of the border may lie nearly level; for trees in such places require, against a south wall at least, all the rain that falls on the border, and frequently more. On the other hand, where the climate is cold and wet, a good slope is advantageous, not only for throwing off superabundant moisture, but also for obtaining the heat from the sun. In such a case the slope may be as much as 1 in 12, or an inch in every foot; so that a border 12 feet wide would be a foot higher at the wall than at the side next the walk; and if 18 feet wide, 18 inches higher. Under ordinary circumstances, a slope of 1 in 18 is ample fall.

If the bottom of the border is lower than the adjoining subsoil, and the two are not separated by an effective drain, the water from the higher subsoil will naturally drain into the bottom of the border, and cause the soil to become sour. If the border is cut off from the rest of the ground by a proper drain, it will not so readily become water-logged. Let fig. 825 represent a drain, and *a* the level of the surface of the subsoil, below which saturation occasionally takes place. This being the case, the drain must be cut deep enough to draw off the water for at least a foot below the bottom of the soil of the border at *a*. The bottom of a fruit-tree border should not, if possible, be lower than the general level of the subsoil *a*, which would be the case if it were dug out down to *c*, and even at *b* it is liable to be damp; it should therefore be above the line *a b*, as at *d*. The height of the bottom *d* above *a b* should not be less than 3 inches, and it might with greater advantage be a foot were it not for diminishing by so much the height of the wall. This involves the additional expense of four courses of bricks; but if that could be afforded, it would be compensated by the advantages arising from the roots of the trees being perfectly secure from an excess of moisture, and both foliage and fruit would be more exposed to air and light. In low damp situations these advantages are of great importance. If this plan is followed, the surface of the border will be



raised above the general level, unless the border have a less depth of soil than the rest of the garden. It then becomes a question whether the level of the walks should be made to correspond with the general level of the ground or with that of the border. This, however, will be considered when we come to the subject of walks.

It is a question whether fruit-tree borders should be paved in the bottom, laid with concrete, or otherwise rendered impenetrable to the roots of trees. The soil of the most productive part of Kent is largely composed of rock brash, or *débris*, and is locally known as hassock or stone-shatter. The surface of this is a mixture of friable loam, largely intermixed with small pieces of light-coloured Kentish ragstone, and it is from 6 inches to 2 feet deep, resting on solid rock. This land produces hops and fruit in great abundance; likewise good crops of Turnips, Potatoes, seeds, corn, and excellent hay. Fruit-trees of all kinds flourish in it and produce abundantly; even Peach and Pear trees grow with great luxuriance, and are free from disease.

To what are such results to be attributed? Not to the climate, for localities enjoying a higher degree of temperature than the neighbourhood of Maidstone do not produce such fruit. They are due to the soil being naturally in that state best suited for healthy growth. In such a soil fruit-trees grow slowly, produce short-jointed wood, and mature their tissues perfectly as growth proceeds. Here, then, we have a naturally hard rock-bottom producing a healthy and fruitful vegetation.

At Trentham, Staffordshire, on a clayey subsoil, to prevent the injurious effects of the subsoil and situation, the fruit-tree borders are concreted with satisfactory results. We may therefore conclude that paving, or concreting, the bottom of fruit-tree borders is to be recommended in all damp situations. It is of special advantage where the subsoil contains substances injurious to vegetation. In such cases there can be no question as to its utility, and therefore, where expense is no object, it should always be carried out. Fig. 826 shows the wall, construction of paved border, and path in section.

Where the subsoil is good and not too moist, paving may be dispensed with. Its advantages depend upon the peculiarities of the soil, situation, and climate, concerning which everyone must be guided by the circumstances of the case.

Concrete, or grout as builders term it, is a

mixture of lime, gravel, and sand. It is much used for the foundations of walls and houses, and is likewise suitable for fruit-tree borders. The lime should be fresh and newly slacked, and the stones or gravel should pass through a sieve of an inch-and-a-half mesh. Where gravel

soil of the other division of the border should be cleared out by turning it on to the concreted portion and proceeding as before. An edging-board should be used, and care must be taken that the earth is removed perfectly clean at the joint, else it will cause a fissure through which roots may penetrate to the bad substratum.

Instead of concreting the border lengthwise, it may be done in cross sections, provided time is allowed for each to set before being covered with the soil of another. If properly made, this floor will be impervious to the roots of trees, but it will not be much warmer than the natural subsoil on which it rests. If this be undrained, and cold from the presence of spring water, that cold will be communicated to the

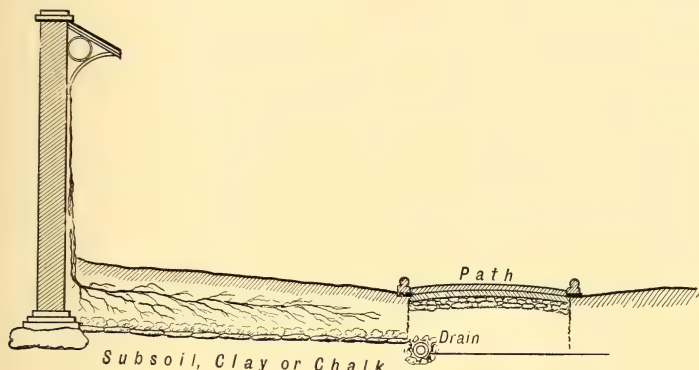


Fig. 826.

is scarce, small broken stones, bricks, or cinders will do equally well. Four parts of clean river, or washed gravel, one part of clean sharp sand, and one part of fresh hot lime, well mixed, and thrown smartly down on the floor of the border to a depth of 4 to 6 inches, make a first-rate concrete bottom for fruit-tree borders. A more durable concrete is formed by adding to the lime one-fourth part of Portland cement, and a layer 4 inches in thickness will serve as well as one of 6 inches containing no cement.

A concrete thus formed will be durable, and impervious to roots; but if gravel cannot conveniently be had, a mortar formed of one part lime to three or four of sand will resist the roots of trees, if laid on a bottom of a uniform solidity to a depth of about 3 inches. This may be found cheaper than concreting.

In proceeding to lay down the concrete, care should be taken to prepare for it an even floor of uniform solidity. The breadth of the border, if not more than 18 feet wide, should be marked off into two divisions. The soil of the one next the wall should be cleared out to the proper depth, the bottom made level and rammed equally all over. The prepared concrete should then be dropped into the hole and placed firmly and regularly all over the bottom and gauged to the proper depth with a straight-edge, making it smooth by beating it evenly with the back of a spade or shovel. This should be done before the concrete has had time to set, for after it does so it ought not to be disturbed. After it has set, which will be in a few days if the weather is fine, the

concrete or other substance with which such water comes in contact; but drain off the latter and more warmth will be the result, the temperature of the air in a drained substratum rising in summer nearly in a corresponding degree with that of the atmosphere, so that both the roots and the branches of the trees are nearly in the same condition as regards temperature.

Whatever mode be adopted, in all cases where the borders do not naturally possess a good bottom, the expense of providing one will be amply repaid by superior crops. The border may be made of the best materials at great expense, but this would be of little avail if the soil were laid on a bad substratum.

SOIL FOR FRUIT-TREE BORDERS.

The best soil for fruit-tree borders is a good loam. For Pears and Apples it may be inclining to clayey loam; but for stone-fruits, such as Plums, Cherries, Peaches, Nectarines, and Apricots, a loam inclining to the sandy is preferable. Under particular circumstances of climate and locality, various compositions have been employed with success. Where the soil is naturally a good fresh loam, trenching will be nearly all that the border will require. If, however, first-rate borders are to be formed and fresh materials introduced, the best is a turfy loam from an old pasture.

In some places banks of loam to a considerable depth occur, and this becomes friable by exposure to the weather; this, when mixed with

good fibrous loam, varying from one-fourth to one-half the bulk, according as the fibrous loam is more or less plentiful, may be safely used. No fresh manure should be put into a newly-made border, as it is liable to cause too luxuriant growth.

In many cases, borders cannot be made entirely of fresh turfy soil on account of the expense. Attempts should, however, be made to improve the natural soil as much as possible with the means at command. If the ground is poor and sandy, manure alone will not produce the permanent improvement in the soil which the trees require. A compost of well-rotted farmyard manure, mixed with equal portions of turf or pure loam, is much preferable; and that this compost may be where it will prove most useful, it should be placed about half-way between the top and bottom. Where good marl can be obtained, it forms an excellent addition to a poor, sandy soil; and a dressing of stiff calcareous clay is generally very beneficial in its results on sandy soils. The dressing of marl or clay may be from 2 to 4 or more inches thick, according to the supply and the needs of the soil. If the soil is naturally a heavy clay, too stiff and tenacious for the healthy and fertile growth of fruit-trees, it should be burned and ameliorated by such means as have been already pointed out in treating of soils.

In situations where the climate is not sufficiently warm to ripen the wood which would be produced by trees in borders formed in the manner directed, great advantages have resulted from mingling stones with the soil of the border. The stones may be broken rock or roundish water-worn or land stones; or the *débris* of old buildings may be used, the old plaster and lime-rubbish being a valuable addition to the mixture, from which, however, all old and decaying bits of wood ought to be carefully removed, as they are liable to produce fungi that are detrimental to the roots of trees. The stones generally should be broken up to the size of half a brick, although a few larger pieces scattered through the mass will do no harm.

A layer 8 inches thick of stones or brick-rubbish might be trenched into the soil, and thoroughly incorporated with it, to great advantage, especially in a wet climate, and on close and stiff soils. A mixed soil of this kind—loam, or clay, stones, and rubbish from old buildings—closely approaches in its mechanical texture and chemical composition the famous

fruit-producing soil in the Maidstone district of the "Garden of England", the county of Kent. In such a soil the trees produce a mass of fibrous roots, which form a network on the stones and other hard substances, and are productive of a sturdy and fertile growth, resulting in abundant crops of fine fruit of the best quality.

The good effects of covering fruit-tree borders with a layer of stones may not at all times be apparent, but some first-rate growers of fruit put great faith in that method of keeping the roots near the surface. Under good management, considerable success is attained by this method on some soils, especially on those resting on a cold, stiff subsoil. Instead of running down into such an ungenial subsoil, the roots push upwards and spread over the soil beneath the stones, where stimulating liquids and beneficial gases from the atmosphere easily reach them, and induce a healthy and fertile growth. On stiff soils this method of covering the borders with stones and applying liquid manure of any approved kind, and which easily finds its way through between the stones to the roots, is superior to top-dressing or mulching with farmyard manure. On light soils, however, farmyard manure is the best mulching or top-dressing; and that made from peat-moss litter, fresh from the stable, is one of the most useful and effective.

The kind of hard materials that may be advantageously mixed with the soil is not unimportant; for the roots of fruit-trees take to some in preference to others, and especially to such calcareous substances as old mortar and plaster. As a general rule, it is admitted that sudden changes of temperature are prejudicial to animal and vegetable health, and hence the roots of plants prefer contact with those substances which maintain the most uniform temperature. Gypsum possessing that property in a high degree should be introduced in borders where the climate is cold and variable. Old plaster, for example, which can in some instances be had in abundance, will best answer the purpose if broken into bits that will pass through a 4-inch ring. Lime compounds of all kinds are slow conductors, therefore pieces of old mortar and chalk lumps may be freely used. Brick-bats—especially from bricks made near London, which consist of a considerable quantity of carbonaceous matter—are very suitable for mixing with the soil of a border requiring what are termed *warm* materials.

We have now endeavoured to point out the

principles, and to detail the modes, of making fruit-tree borders according to different circumstances of soil, subsoil, and climate. Where all these are favourable, proper trenching and levelling are only necessary. If the subsoil is bad, or cold and wet, its contact with the roots should be cut off by an impervious and somewhat elevated floor of concrete; if the soil is indifferent, it should be ameliorated as much as possible; if bad, it should be entirely removed, and a better soil substituted. Where the climate is at fault, it is advisable to use rather light soil, mixed with stones and other hard substances. There are, however, without doubt, very many cases where borders could not, on account of expense, be made so effectually as we have recommended. In these cases the borders should not be deeply trenched, if by so doing the principal roots would be encouraged to occupy a position unfavourable to the health of the trees. It will be better to depend on keeping the roots near the surface, and there feeding them by means of a well-prepared compost of dung, and the most suitable kinds of soil that can be obtained.

PREPARATION OF THE GROUND.

The formation of the borders having been completed, the preparation of the rest of the ground may be proceeded with. Where the surface is level, or of the proper slope, and the soil naturally good and of the sufficient depth, merely trenching it over in the usual way renders it fit for laying out and cropping. Where the ground is, on the contrary, irregular, and the undulations of the subsoil, not corresponding with those of the surface, render the soil of unequal depth—or where soil has to be wheeled or carted from one part of the ground to another, or introduced from the outside—the operations become complicated, and various preliminary considerations are necessary in order that the work may be commenced at the proper place, carried on with regularity, and in the best and most economical way.

It is presumed that the level of the ground has been previously determined, as recommended in the section on levelling, and that the depth of soil has been ascertained. By digging down to the subsoil at a number of points, adding together the depths, and dividing by their number, the mean depth of the soil will be found. At the same time, the depth at which the subsoil lies below the proposed surface level, at the different points, should be marked on a

plan. By these means we come to the knowledge of the present position of the subsoil, and also that which it should be made to occupy.

If the surface is to be made level, and if the soil is to be of uniform depth, then the substratum must also be made level, or preferably with a slight declivity towards drainage. If the surface is intended to have a regular slope, the substratum ought to have a corresponding one. In either case it is evident that attention should be first directed to the levelling of the bottom. When a trench is turned out to the depth of all the good soil, its bottom most probably will be very irregular; portions of it may be too high or too low, which should be rectified before the soil of the next trench is moved. The work should be commenced in the lowest part of the ground, taking care, however, to leave roadways for carting materials if necessary.

In trenching level ground the ordinary trench, about 3 feet wide, will be found most convenient; dividing the ground into convenient portions,

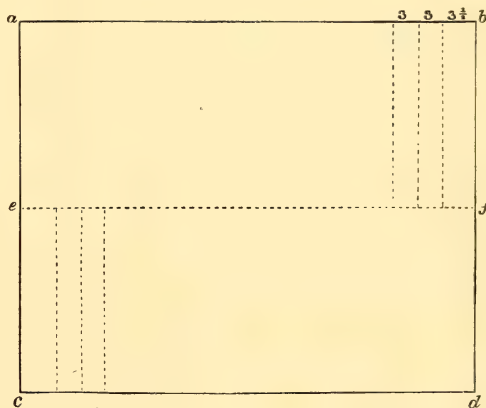


Fig. 827.

as represented by $a b c d$, fig. 827. It is better to divide the ground into two sections, as shown by line $e f$. Then dig a trench from b to f , and lay the soil on the adjacent half, from f to d . When the operation reaches $a e$, the open trench is to be filled by the soil taken from e to c , the last trench at $f d$ being filled by the soil placed there from the first trench $b f$. Where the ground is very uneven, and where the bottom has to be raised or lowered to a considerable extent, the width of the trenches may be 4, 5, or even 6 feet.

Hitherto we have chiefly directed attention to bringing the substratum to the proper level, and when this is done, the good soil will require to be made of uniform depth by removing

portions from where it is deeper than the average, to where it is too shallow. In general it will, however, be found best to throw up the soil at the place where an extra depth occurs, and then to regulate the surface after the whole of the ground has been trenched. If additional soil or manure are required they may be introduced as the trenching proceeds. The latter should be placed half-way between the top and bottom, and a good layer of well-rotted dung should also be dug or ridged in near the surface of the ground, after the latter has been levelled, especially if much fresh earth has been turned up.

Although it is desirable to obtain a depth of at least 2 feet of soil for a kitchen-garden, and the ground should be loosened to that depth, yet it may not, in some cases, be advisable to turn the lower part of the trench uppermost. If there be a foot deep of black soil, and as much of good loam beneath, the whole may be turned upside down; but if the black soil is shallow, or if the bottom part of the trench is a clayey loam, it will be advisable merely to loosen it a spit in depth in the bottom of the trench, and so leave it to be gradually brought up, a little at a time, at subsequent trenchings.

WALKS.

In planning walks for the fruit and kitchen garden, utility ought to be the leading principle; whilst regularity should be kept in view as much as possible.

With regard to their number and direction, the necessity of one all round, so as to leave a border of greater or less breadth between it and the walls, is universally admitted; and two intersecting each other in the centre of the garden are found convenient. This arrangement is very generally adopted. Besides these principal walks, two or more subordinate ones, as represented in fig. 793, may be necessary; but the number and direction depend upon the extent and form of the ground.

Where walls for fruit-trees form the fence the distance of the walls from the outside walks will be according to the width of border provided for the trees. Supposing the walls are 12 feet high, and that the enclosed area consists of 2 acres or more, the distance of the walks from the walls may be 18 feet. If the wall on the south side is lower than elsewhere, as is frequently the case, the walk next it may be 12 feet distant. Where the area is between 1 and 2 acres, the walk in front of the south-

aspect wall may be still 18 feet distant, and that by the north-aspect wall 12 feet; but the others on the east and west sides 15 feet. In smaller gardens the distance of the walk from the walls may be only 12 feet, in order that the ground to be laid out in quarters may not be too much reduced; whilst in very small gardens the walks may run within 3 or 4 feet of the walls, except that facing south, the border of which should be as wide again, this, from its south exposure, being so useful for early crops.

The width of the walks should be in proportion to the extent and character of the garden. For small gardens the walks should not be less than 5 feet wide. In gardens of between 1 and 2 acres, the walks should not be less than 6 feet, whilst in those of larger extent they may be 7 feet; and to admit of manure, &c. being conveniently carted along the cross walks they may be 8 or 9 feet wide, with a circle, where they intersect, large enough to admit of a horse and cart turning round in it. These are fair average widths for walks in gardens of the various sizes, as they afford sufficient free space for working operations.

The width of walks having been determined, we have next to consider their height with reference to the general level of the ground. Generally the edges may be made a little lower, and the middle or crown a little higher than the soil level. The lines of the walks having been set out and marked by small stakes driven at each end of them, so that the tops of the stakes shall also mark the proposed height of the edging, the soil should be well trodden or otherwise made compact, then by means of boring or levelling rods, a number of points should be made on the same level as the tops of the stakes at each end. When the soil has been taken out to the proper depth, the line should be again stretched so as to mark exactly the line of edging, and Box, the best kind of live edging, may then be laid.

The excavation should be deep enough to hold a sufficient depth of materials to constitute a walk substantial enough for wheeling upon. The cross walks, where wide enough, and in fact all the walks in large gardens, should be firm enough for carting upon. The excavation for this should be at least 9 inches deep from the level of the edging, but where the heaviest traffic is wheeling, 6 inches will be sufficient. It is a question whether the bottom of the walk should be dug out level, convex, or concave. The best plan in dry climates, and on friable soils, is to give the bottom a curved form like that

of the surface of the walks, in order that the water may fall to both sides, where the well-drained and trenched ground will always be in condition to receive it.

In wet climates, drains at each side of the walk may be necessary to prevent water from ever standing in pools on the surface of the walk during heavy rains; but in localities where the rainfall does not exceed 28 inches annually, all the water that sinks from the walk into the adjoining soil will prove highly beneficial to the trees, and in some cases may save the labour of watering.

Various materials may be used for the bottoming of walks, such as stones, flints, brick-bats, clinkers, lumps of hard lime-rubbish, burned clay—in short, any hard substance that contains nothing pernicious to vegetable life may be employed. Granite, broken to pass through a 3-inch ring, is perhaps of all others the most durable; and broken whinstone, or trap rock, is nearly as substantial. Nine inches thick of such firm material, with 2 inches of rather coarse, and one of fine binding gravel at top, form an excellent walk. Indeed 6 inches of broken granite and 3 inches of gravel will make a good substantial walk.

If gravel is not obtainable, sand may be made to answer very well, but it loosens exceedingly after frost, so as to render walks made with it unfit either for walking or wheeling upon for a considerable time. Decomposed sandstone answers tolerably well. A mixture of coal-tar and sand was once somewhat popular for surfacing walks, but at best it is very unsightly, and if not laid on very thick, is liable to break when wheeled upon in cold weather. In hot weather the tar melts, and has a very disagreeable smell, and it is, moreover, dangerous to the roots of trees. Its use is therefore not to be recommended.

If we take into consideration the cost of gravel walks in the first instance, and the subsequent expense of weeding, even with the aid of patent weed-killers, rolling, and occasional renewing, it is more than probable that cement concrete would prove cheapest in the long-run. Once a cement concrete is properly laid down, on a substantial broken-stone bottom, the same as a gravel walk, and well set, as it will be in twenty-four hours, it is practically imperishable under fair traffic and treatment. No weeds grow upon it, and it requires the minimum of labour to keep it clean. The cost of a well-made Portland cement walk for wheel-barrow traffic is about 2s. 6d. per square yard, and for one strong

enough for occasional horse and cart traffic, the cost is from 3s. to 3s. 6d., according to the amount of cement and depth of materials. One of good cement to three of sharp gravel, or pulverized granite, mixed dry, and laid down, levelled, and smoothed while wet, makes a first-class and durable garden walk.

To meet limited means, a less expensive walk may be made as follows. Let the bottom of the walk be taken out to the depth of 3 or 4 inches, let it be well beaten, and rolled, and raised in the middle. Care should be taken to make the bottom regular. A layer of lime-rubbish, or any other hard material that can be most readily obtained at the least expense, should be spread evenly over the bottom, and well rolled until the surface is almost as even as that of a finished walk. A coat of gravel should then be laid on, to the thickness of 2 or 3 inches, treading, raking, and rolling it before it gets dry. By rolling into the surface a thin coating of fine gravel every two years or so, the walk will become more and more solid. If there should occasionally be much wheeling upon it, planks could be used.

Walks are sometimes objectionable from the surface being too loose because of the gravel not possessing binding qualities; or the gravel may be too loamy, and bind firmly in dry weather but become soft and sticky in wet. This could be remedied by screening the gravel, and at the same time washing away the superabundant loam which it contains, so that it will not adhere to the feet.

The centre of the walk should be a few inches higher than the sides according to its width—say 4 inches for a 6-foot walk, 6 inches for 12 feet, and 10 inches for 16 feet. The surface of the gravel is most easily made uniform when the exact height of the centre of the walk is first set out by means of the boning rod and pegs.

Edgings for Walks.—Amongst the various plants which have been proposed for edgings, the dwarf Box, which has been so long employed for the purpose, still unquestionably maintains its pre-eminence. In small gardens, such dwarf and compact growing plants as London Pride, Sea Pink, Gentianella, Ivy, Thyme, Parsley, and Strawberries are sometimes employed; but none of them approaches Box in neatness of appearance and ease of keep. Live edgings are all more or less objectionable on account of their harbouring vermin. A Box edging, however, can be kept within such small limits that it affords but little shelter for anything hurtful

to vegetation. In many gardens the walks are edged with tiles, bricks, stone, or wood, and when properly laid these are generally preferable to plants for the purpose. They are, however, more expensive.

From what has been stated, it is clear that the walks in a fruit and kitchen garden should run in straight lines; that they should be of equal breadth throughout; that they should be made so as to bear the greatest weight that may be brought upon them in ordinary circumstances; that their surface, from end to end, should be perfectly level or uniformly sloping; that the elevation of the middle above the sides should be sufficiently great to ensure dryness, but not greater than will allow of comfort in walking; and, lastly, that the margin between the walks and the soil should be clearly defined by means of a distinct edging.

[M. D.]

CHAPTER II.

ORCHARDS.

THE FORMATION OF NEW ORCHARDS—SOIL—SOIL PREPARATION AND IMPROVEMENT—MANURES—GENERAL MANAGEMENT OF ORCHARDS—IMPROVING OLD ORCHARDS.

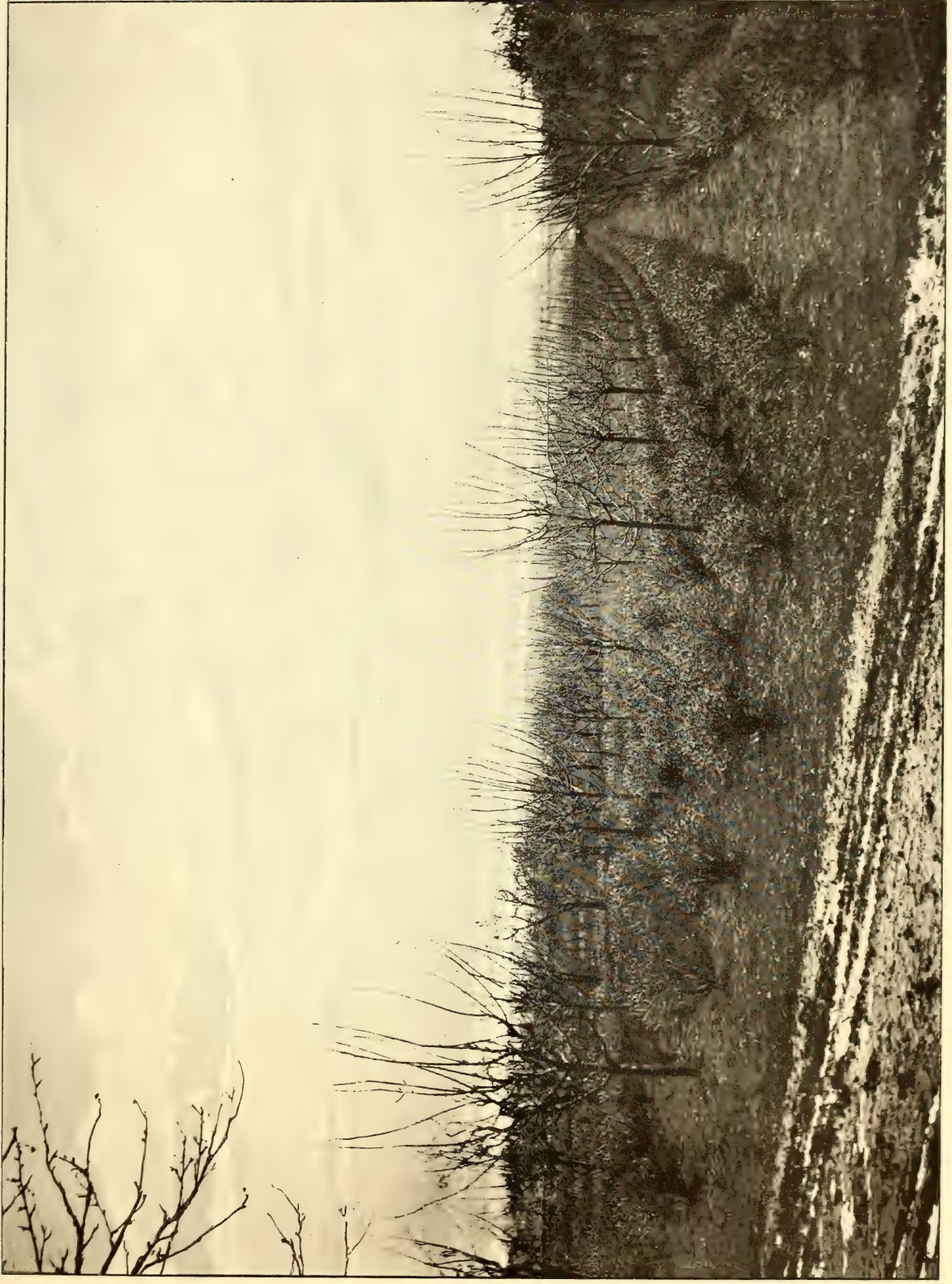
Orchard planting has received great attention in the British Isles at different periods of our history, and for different objects. The establishment of orchards on an extensive scale dates from the seventeenth century, when the production of cider as a substitute for foreign wines was the principal aim of the planters. Many of the ancient orchards in the west of England had their origin about that time, and as the cider industry advanced in importance the area devoted to fruit-trees was largely extended. During the following century beer gradually took the place of cider as a general beverage amongst the working-classes, while the consumption of imported wines increased greatly amongst other classes, to the loss of the cider-makers and fruit-growers. Then a long period of neglect succeeded; the varieties of Apples that had been chiefly planted were not adapted for any other purpose, and in consequence a large extent of orcharding became practically valueless. In the course of the nineteenth century, however, the demand for Apples and other fruits increased as the population advanced, with the result that orchards of a different character were planted, for the production of Apples that could be utilized either

for sale or home consumption in a fresh or cooked state. With this object the attention paid to orchards is increasing every year, and the subject has now assumed an importance it has never previously possessed.

It will be convenient, in dealing with this matter, to divide it into three sections. 1st, the formation of new orchards; 2nd, the management of established orchards; and 3rd, the improvement of neglected orchards. Under each division of the subject some consideration will be devoted to the three general types, namely, the commercial orchard, or fruit plantation, the sole object of which is profit; the farm orchard, for home supply and the sale of surplus crops; and the garden or home orchard, which is usually on a smaller scale, and is intended mainly to furnish supplementary supplies to those afforded by garden trees, or it constitutes a portion of the garden itself.

The formation of New Orchards.—The establishment of a new orchard is not a matter that can be lightly undertaken if success is to be ensured. So many conditions exercise a bearing upon the results that the most careful consideration is requisite to provide for probable contingencies. Even on a small scale the expense of forming permanent plantations is heavy, and a long period often elapses before it is perceived whether the outlay has been judiciously directed or otherwise. In the event of failure occurring from the operation of causes that might have been foreseen, not only is the loss serious, but the disappointment is such as to prevent any further attempt. Much harm has in this way been done to fruit culture generally, and to orchard planting in particular, by ill-advised schemes, or by defective attention to essentials at starting. These essentials we now purpose to briefly review.

In selecting a site for a permanent plantation of fruit-trees the points that demand attention are the elevation, aspect, and shelter of the land. Each of the characteristics named exercises a marked effect upon subsequent progress and returns. With elevation is included not merely the actual height above sea-level, but also the relative altitude as compared with neighbouring land, for that is often of even more importance. It is well established that on low-lying land, and in enclosed valleys, frosts are frequently severe and destructive in the flowering season of fruit-trees, and the difference in this respect is often strongly marked when there is higher land in the immediate neighbourhood occupied with similar crops. Unfortunately it is a matter that



APPLE ORCHARD AT EVESHAM

Trees 12 feet apart. Gooseberries as undergrowth. Shelter-belt of Damsons on right



has been many times overlooked when choosing sites for fruit plantations, with the result that repeated disasters have been experienced.

It is impossible to formulate a rule that will apply to all districts, as local conditions often exercise a complicated influence, but in general, as regards the central portion of England, most distant from the coast in every direction, a lower elevation than from 350 to 400 feet above sea-level is exposed to considerable risks from spring frosts. As the coast is approached the minimum altitude of comparative safety falls until near the sea, where the lowest point is reached. As already indicated, this is affected to some extent by the neighbourhood of higher land, as the low temperatures are mainly due to the descent of cold air from greater elevations, and to air-stagnation. Especially unfavourable effects are produced when the more elevated land is on the south or south-west side, and when the lower sites are more or less enclosed, preventing the escape of the cold heavy air.

The necessity for what is termed atmospheric drainage has received some consideration in the United States, and as Professor L. H. Bailey says, the "escape of cold air is the secret of much of the success of fruit-growing on rolling and sloping land". This is unquestionably the fact, and many examples could be found in this country where, though the actual elevation of the orchard is lower than might be considered safe, yet owing to the proximity of still lower land the ill effects are avoided to a large extent.

The aspect of an orchard site has a bearing upon success in several ways, especially if the land slopes in a particular direction. A northerly slope is obviously unfavourable to wood and fruit ripening, but such inclines can occasionally be utilized on a small scale for the prolongation of supplies. An easterly direction is a source of danger in time of frost, because the rapid thawing of slightly-frozen flowers, caused by exposure to the rays of the early morning sun, will often bring a destruction that might have been avoided under other circumstances. A direct south-west exposure necessitates adequate shelter, or when the trees are laden with fruit the gales commonly reaching us from that quarter will do much damage.

The question of shelter generally requires careful consideration, for it is certainly extremely disadvantageous to plant fruit-trees in very exposed positions unless some protection can be afforded. It is not only that the trees themselves are often damaged, but the fruits,

particularly Apples, even if not blown off, are so bruised as to be rendered almost worthless.

Belts of trees will afford this shelter, and these can be formed at moderate expense if there be land available for the purpose. Where quickly-developed protection is required nothing surpasses the Poplars for rapid growth, but they are objectionable in some respects, chiefly as the haunt of many insect pests. Mixed plantations of deciduous trees with Conifers also constitute efficient shelters, while for hedges near the orchard as wind-breaks, the Cherry Plum or Myrobalan (*Prunus cerasifera*) is admirably adapted, being of strong growth in all suitable soils, and forming a thick fence in a few years.

Soil.—An ideal soil for almost all the hardy fruits employed in the formation of orchards and plantations is a substantial loam resting on a well-drained subsoil. For Apples it may be fairly heavy, cool, and moist, but even for them it should be of a nature that admits of free cultivation. A near approach to clay is as objectionable as a sterile sand.

The physical condition of a soil is often of more importance than its actual constituents, as by mechanical means and the employment of suitable manures great improvement can be effected if the soil be neither excessively tenacious nor too sandy. Still, if it is possible to make a choice, preference should be given to a moderately heavy soil rather than a light one, if Apple-trees are to constitute the whole or major part of the plantation.

It has been shown by chemical analysis that all our hardy fruits abstract from the soil a large proportion of phosphoric acid and potash, therefore land that is to be utilized successfully for fruit culture must contain plentiful stores of these essentials. An analysis of a soil is a useful guide in this respect as indicating what is present in it, but even the best analysis cannot tell precisely what proportion of the substances present are immediately available to the roots of fruit-trees, or plants generally. In consequence it sometimes happens that on land showing widely different results in analysis equally marked success in fruit culture may be obtained. But the analysis of a soil is valuable in another way, namely, it shows whether an important constituent is seriously deficient, and it also points out the presence of a substance that may be positively injurious. Therefore it is advisable, before undertaking the expense of preparing a large area of land for fruit plantations, to secure a reliable analysis of the soil.

As examples of the variation in the chemical

constitution of soils equally well adapted for orchard cultivation we give the three following analyses from land in Hertfordshire, Kent, and Herefordshire, respectively, where fruit has been largely grown for a century or more. The first was prepared by the elder Dr. Voelcker, and the two others by Dr. J. Augustus Voelcker:—

ORCHARD SOIL IN HERTFORDSHIRE.

	Per Cent.
Organic Matter.....	6·344
Oxide of Iron.....	5·312
Alumina.....	4·560
Lime.....	3·312
Magnesia.....	·432
Potash.....	·468
Soda.....	·179
Phosphoric Acid.....	·204
Carbonic Acid.....	1·640
Sulphuric Acid.....	·109
Nitric Acid.....	·001
Chlorine.....	·011
Insoluble silicates and sand.....	77·401
	<u>99·973</u>

ORCHARD SOILS.

	In Kent. per cent.	In Hereford- shire. per cent.
¹ Organic matter and loss on heating.....	5·07	4·39
Oxide of Iron.....	3·63	4·81
Alumina.....	3·51	6·75
Carbonate of Lime.....	1·48	·79
Magnesia.....	·42	1·29
Sulphate of Lime.....	·34	·02 ²
Potash.....	·30	·72
Soda.....	·01	·15
Phosphoric Acid.....	·01	·06
Insoluble silicates and sand.....	85·14	81·02
	<u>100·00</u>	<u>100·00</u>

To prove what enormous quantities of the most important constituents are present in good soils Dr. Voelcker calculated that in 6 inches depth of the Hertfordshire soil he analysed, the following were the total weights of the respective substances per acre:—

	lbs. per acre.
Phosphoric Acid.....	4569 = over 2 tons.
Potash.....	10483 = „ 5 „
Lime.....	74188 = „ 33 „
Magnesia.....	9676 = „ 4 „
Sulphuric Acid.....	4569 = „ 2 „
Nitric Acid.....	22
Nitrogen.....	2397 = „ 1 ton

Soil preparation and improvement.—The land selected for a new orchard may have been subjected to ordinary garden cultivation, it may be a portion of the arable land of a farm, or it may be a pasture. In the first case probably no special preparation will be needed, but in the other two it will. If on the arable land shallow ploughing only has been adopted during a long

period, one of two courses will be necessary, *i.e.* deep or subsoil ploughing, or trenching by hand. If a “pan” has been formed, as is frequently the case in some soils, it must be broken up to permit the roots of the trees free extension, and to ensure due circulation of moisture in the soil. If standard Apples, Pears, or Plums are to be planted at distances of 20 to 30 feet apart, and the intervening spaces occupied only with vegetable crops, then double ploughing, supplemented by trenching for each station to be filled by the trees, will be sufficient. If, however, it is proposed to form a commercial plantation comprising both standard and dwarf trees with bush fruits between, the preparation of the whole of the ground by means of trenching, costly though the process be, is at the same time more economical in the end. In any case, should the land be foul with weeds, particularly those with creeping roots like Twitch, not only will a thorough forking be essential, but a season's close cropping, with the attendant cultivation, is most desirable prior to the orchard planting.

Grass land to be devoted to orchards offers several important problems for solution. It has been demonstrated by experiments both in the United States and in Great Britain, that grass growing over, or in close proximity to, the roots of newly-planted young fruit-trees is injurious to them, stunting the growth, starving the tree, and either crippling it for many years, or rendering it entirely useless. Many attempts at the formation of new orchards, or the restoring of old ones, have failed through this cause.

If it is desired to plant fruit-trees in a thriving pasture, this can be done if a portion of the ground surrounding each tree is kept clear of grass. For standard Apples on crab stocks a space 6 feet in diameter will suffice at least for the first four or five years, after which the trees should be able to take care of themselves.

Bastard trenching is preferred for orchards, *i.e.* two full “spits” of soil are moved and broken down, but each is kept in the same relative position, *i.e.* the lower spit is kept below, and the upper one on the top. In addition, the soil beneath the second spit is also stirred or broken with the spade or fork if it be heavy or hard. If the preparation is for immediate planting, without an intermediate course of cropping, the trenching cannot be done too well, as in all heavy soils it will be the means of unlocking abundance of pent-up plant food. After planting, digging can be of only a partial and imperfect character.

¹ Nitrogen = 19 = to Ammonia = 23. ² Sulphuric Acid.

It is assumed that farm land to be appropriated to the orchard has been previously properly drained, that there is a very porous subsoil, or the natural surface drainage is sufficient, otherwise it will be necessary to have the land efficiently drained.

Manures.—In the application of manures before planting several points require consideration. While it is not desirable that fruit-trees should be stunted in their early stages, it would be unwise to induce excessively vigorous growth,

the effect of which would be to unduly postpone the period of fruit-bearing. As a general rule, a moderately heavy well-worked soil can supply all that a young fruit-tree requires for its early development. On the other hand, if the soil is somewhat poor and light, and there is reason to believe that owing to defective cultivation in the past it is not in a condition to ensure continued growth, a liberal admixture of old stable or farmyard manure (12 to 20 tons per acre) may be very beneficial. It is a case for the exercise

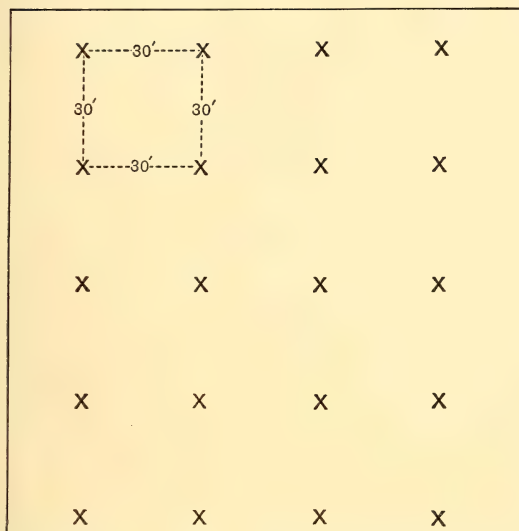


Fig. 828.—The Square System.

= Standard Fruit-trees: 30 feet \times 30 feet.

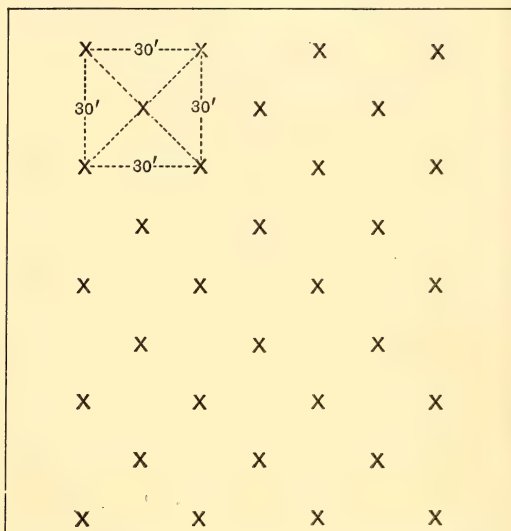


Fig. 829.—The Quincunx System.

X = Standard or Dwarf Fruit-trees. The lines can, however, be formed with Standards and Dwarfs alternately

of the cultivator's judgment. In one instance the application of manure may be not only wasteful, but injurious; in the other it may be found a profitable investment.

But there is another respect in which natural and bulky manures prove beneficial, and that is in their physical or mechanical action of opening the soil, ensuring better aeration, and consequently a more rapid breaking down of the various compounds to fit them for the use of the trees. This applies specially to heavy soils, and we have seen remarkable effects produced on the growth of Apple-trees by the incorporation of such an unpromising substance as fibrous peat in a very heavy soil prior to planting. For the same reason the growth of green crops to be ploughed or dug in previous to planting is also beneficial on such soils.

The arrangement of the orchard and the general plans for fruit plantations require some discussion. As regards the orchard proper, there are four systems upon either of which the

trees can be conveniently arranged. These are:—

1. The Square system (see fig. 828). In this the trees are arranged at equal distances each way, so that each tree stands at the corner of a square. This is convenient for planting and working, and is best adapted for permanent plantations, although it admits of fewer trees per acre than the others at the same distances.

2. The Quincunx (see fig. 829) is a modification of the square system, in which an additional tree is planted in the centre of each square. This obviously allows of a much larger number of trees to the acre, and is to be preferred where the intention is to reduce the number of trees by thinning.

3. The Triangular or alternate system (see fig. 830) is still another modification of the last, the trees being arranged so that they are equidistant in the lines, and the rows are the same distance apart; but each alternate line is commenced opposite the centre of the space between

two trees in the adjoining lines, and thus they stand in triangular form, the trees in the adjoining rows being slightly farther apart than those in the rows. This also is best adapted for a permanent plantation, as it does not admit of convenient or equal thinning.

4. The Hexagonal arrangement (see fig. 831) permits a more equalized occupation of the ground than any other, as all the neighbouring trees are the same distance apart, each three trees forming the corners of an equilateral

triangle. This does not lend itself to ready or equal thinning without the removal of a large number of trees. It must be remembered that the distance between the rows is less than between the trees in the row.

The question as to whether there is any advantage in the rows of trees running in any particular direction is a difficult one, as the results mainly depend upon local circumstances, which are rarely repeated under precisely the same form. As a general rule, it may, however,

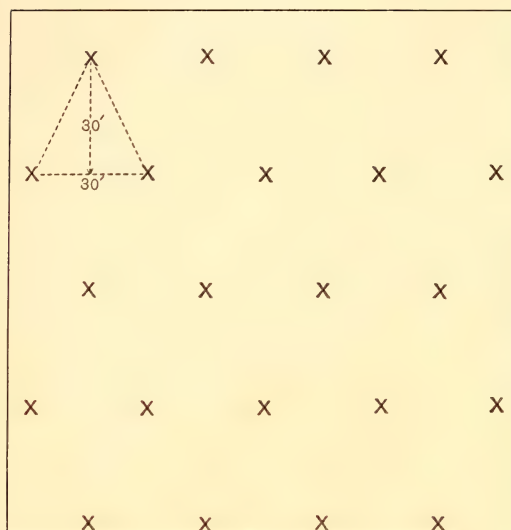


Fig. 830.—The Triangular System.

X = Standard Fruit-trees. Distance between the rows and between the trees in the rows = 30 feet.

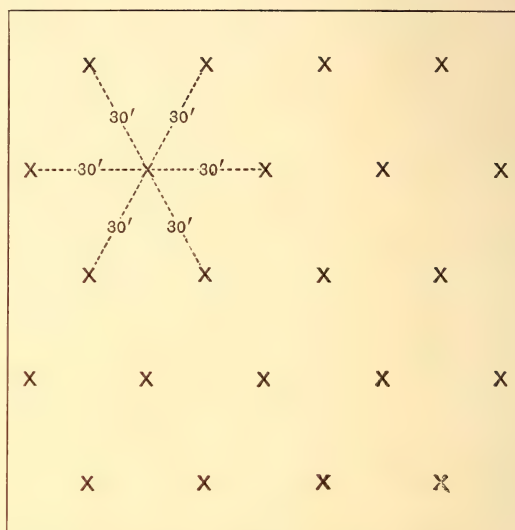


Fig. 831.—The Hexagonal System.

X = Standard Fruit-trees. All the trees 30 feet apart in each direction.

SCALE: 50 FEET TO 1 INCH

be taken that the less the trees are shaded by their neighbours the better, and there is also the prevailing direction of the winds to be considered. For this reason in many places there seems to be a material advantage in allowing the rows of trees to run due north and south, thus permitting a free exposure to the sun's rays at the most important part of the day, and at the same time preventing the south-west winds from sweeping up the rows of the trees, though this is effected at the expense of the part of the plantation which is exposed to that quarter. Due shelter, as already advised, should, however, always be provided on that side.

The foregoing remarks refer mainly to the arrangement of standard trees planted from 20 to 30 feet apart, though of course it is obvious they are equally applicable to bush or pyramid trees at smaller distances. Under each of the systems described it is also possible to form commercial plantations in which the interspaces can be filled in various ways with bush and

small fruits. We will illustrate some of the most approved methods for such arrangements; but as these depend chiefly upon the distances at which the permanent standard trees are to be planted, this matter must be referred to first.

Standard Apples and Pears can be planted at any distance from 20 to 30 feet apart, but they can be classed according to their habit of growth in three groups, *i.e.* small growers at 20 feet, medium growers at 24 feet, and strong growers at 30 feet. The first-named distance is also a suitable one for most Plums, and the last one for Cherries. But in many respects, where mixed plantations are formed, the 30-feet distance is most convenient, allowing ample space between the lines for intercropping, an important matter where quick returns and constant occupation of the land with crops of some kind are needed. We shall, therefore, take this as the best adapted to illustrate the arrangement of plantations, and it can be modified according to circumstances and requirements.

One of the simplest methods is that shown in fig. 832, and it has been adopted in several market orchards with satisfactory results. In this, standard trees are arranged at 30 feet apart each way (on the square system), with bush or pyramid Apples or half-standard Plums between these in the rows at 15 feet apart, and Currants and Gooseberries again between these at 5 feet apart. The spaces between the rows are then subjected to alternate cropping in this way. One space is planted with Vegetables, the second

with Gooseberries, the third with Currants, and the fourth with vegetables, repeating this order throughout the plantation. When the bush fruits give signs of exhaustion, or cease to be profitable, they are removed, and the vegetable quarters are devoted to fresh plantations, the spaces previously occupied with the bushes are then devoted to vegetables. In this way there is always a succession of young bushes in free bearing, and the land is kept in well-worked fertile condition. Strawberries or Rasp-

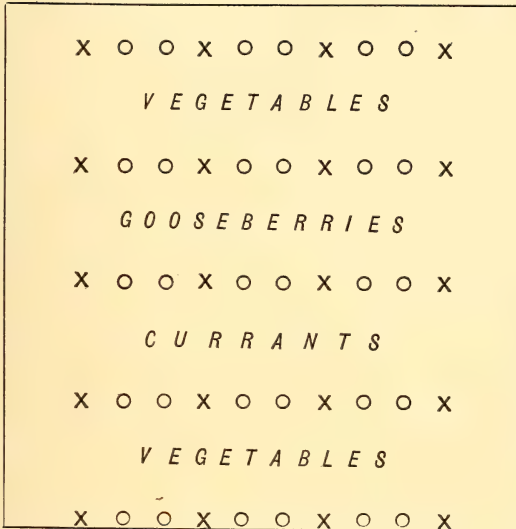


Fig. 832.—Mixed Plantation.

X = Standard Fruit-trees—30 feet × 30 feet. O = Dwarf Apples, Pears, or Plums 10 feet apart in the rows. Intermediate spaces cropped with vegetables and bush fruits alternately.

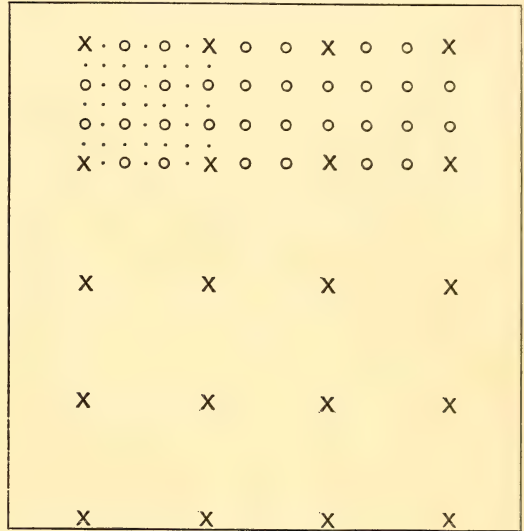


Fig. 833.—Mixed Plantation.

X = Standard Fruit-trees—30 feet × 30 feet. O = Dwarf Apples, &c., at 10 feet. . = Gooseberries and Currants at 5 feet.

berries can be substituted either for Gooseberries or Currants, or both, or they can be employed in addition; and a system of alternate cropping such as this is most suitable where Strawberries are grown.

If the land is to be devoted entirely to fruit, some modification of the scheme shown in fig. 833 can be adopted. There we again take the standards at 30 feet apart in the square system, with two rows of bush Apples, Pears, or Plums between at 10 feet apart, the intermediate spaces being again filled with small fruits at 5 feet. In plantations of this kind the process of thinning simply consists of the removal of the small fruits first, and the bush Apples, &c., later as they become too crowded, ultimately leaving the standards the whole of the ground. Protective and useful boundaries to any of these plantations can be formed with Damsons and Nuts, either as hedges or as part of the general arrangement. As a rule, however, the former

method is preferable, as there is then no interference with the general design.

General Management of Orchards.—One of the first considerations in regard to an established orchard is how the ground is to be treated in the plantation. If the trees have been planted in grass, a space of six feet diameter (as previously advised) being cleaned around them, they require protection if cattle, sheep, &c., are turned in to graze. Even if fowls or pigs only are in the orchard, some means must be adopted to prevent their disturbing the soil over the roots of the trees. We have seen young trees repeatedly ruined by their roots being bared, and it is one of the difficulties of the farm orchard, but a few stakes and a ring of wire-netting will usually suffice to prevent this. If the grass is cut for hay and not grazed, the land must be treated generously in the application of manurial dressings, especially in the neighbourhood of the trees.

When the trees have made free growth, and the roots have reached the limit of the prepared soil, it becomes a question whether the area cleared of grass round the trees should be farther extended or not, and the matter has a wider bearing than appears at first sight. When a tree is well rooted and developing freely, a moderate check would have a tendency to promote earlier fruit-bearing than if it continued to make unrestricted growth. It is upon this

restriction of growth and the promotion of fertility. It is, therefore, largely a matter for close observation to determine whether the cultivated area round a tree in grass should be extended or not. When the trees have made ample vigorous growth and do not appear to be getting into a fruit-bearing state, we should allow the restricting influences to exercise their effect. If, on the contrary, the trees are not developing freely, we should endeavour to encourage increased root action.

Where the whole of the ground in an orchard is cultivated or cropped, the hoe should be freely used. The destruction of weeds is an important service, but the constant moving of the surface soil is of greater benefit in preventing cracking and the excessive loss of moisture in dry weather. If the plantation is wholly occupied with fruit-trees and bushes planted closely, very little more can be done to the land in the way of cultivation. When, however, alternate spaces are devoted to vegetables, deep cultivation is requisite. In many market orchards continuous cropping with both flowers and vegetables is carried on to within a foot or two of the tree stems. In plantations near large towns, whence constant and large supplies of stable

manure have been obtained and applied to the land over a long period, it is probable that the rough system of root pruning, which is performed in the digging and planting, may tend to prevent the undue luxuriance of growth that would otherwise result in such soils. In general practice such close cropping is not desirable, and we have found that in the early years of a plantation it is not advisable to crop to within a less distance than five feet from the stems.

At several of the experimental stations in America attention has been given to catch-cropping, with the object of preventing the nitrates formed in the soil during the summer from being washed out during the autumn and winter, but the matter has not received much attention here, and it is a question how far such cropping will pay. In the ordinary way crops are grown which can be sold from the ground

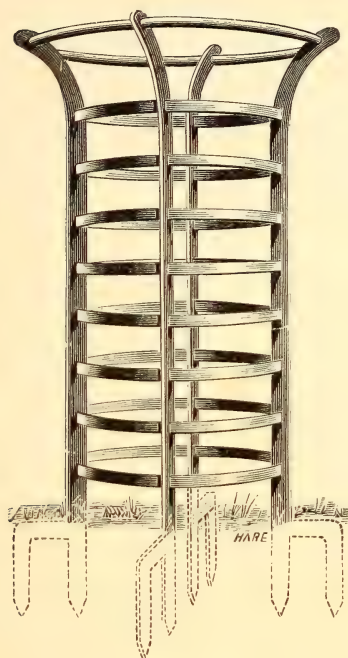


Fig. 834.—Wrought-iron Tree Guard.

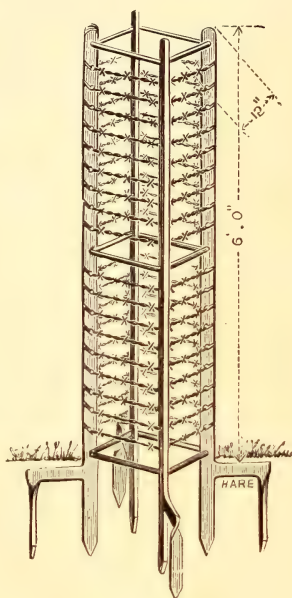


Fig. 835.—“Porcupine” Tree Guard.

the opinion rests, which prevails in some fruit-growing districts, that it is advantageous to have some trees (especially Plums and Cherries) entirely in grass when they have passed their earliest stages. It is found, also, that the fruit of Plums particularly is usually obtained under such circumstances in better saleable form, brighter, cleaner, and of higher flavour than in open cultivated soil. As regards Apples and Pears, the presence of grass also has a decided tendency to increase the colour of the fruits, but when these trees are on the Paradise or Quince stocks respectively the effect in reducing the size of the fruits is just as marked. A strong established standard tree on the free stock is not, of course, affected to the same extent, and the influence on the colour and appearance of the fruit is then an advantage. The firmer soil round the prepared area into which the roots penetrate further aids in the

in winter or spring, either flowers or vegetables.

Cultivating orchard-land with leguminous crops has also been tried rather extensively with the object of enriching the soil and testing the effect on the trees. But it appears from observation in this country that while the tree is young, and at the season of full growth, any kind of crop will inflict some injury on the trees simply by the withdrawal of water from the soil.

When manurial aid becomes needful to an established orchard either from defective growth or sterility (provided the latter is not due to extreme vigour), moderate dressings of old manure from the stables or farmyard applied to the surface at the rate of 10 or 12 tons per acre every year until an improvement is effected will generally accomplish its purpose. Failing this, resource may be had to artificial or mineral manures. If growth is weak, nitrate of soda at the rate of $1\frac{1}{2}$ cwt. to 2 cwts. per acre will in many soils produce a marked effect in a short time, provided other needful soil constituents be present; or sulphate of ammonia may be employed instead at about $1\frac{1}{4}$ cwt. to $1\frac{3}{4}$ cwt. for the same space. The first should be applied just as the leaves are expanding and when the soil is moist; the second should be given at least two months before growth starts. In cases of defective fertility superphosphate of lime and sulphate of potash can be used, the former at the rate of 2 to 3 cwts. and the latter at $1\frac{1}{2}$ to 2 cwts. per acre, the smaller dressings being preferable in each case. These can be mixed together and applied in the autumn after the leaves have fallen. There are many other nitrogenous, phosphatic, and potassic manures in the market, some of which are excellent, and there are several forms of crushed bones and bone-meal which are admirable fertilizers for orchards.

The routine work in an orchard comprises many matters in which the most watchful care must be exercised. The pruning and development of the trees require to be studied closely, the bark injuries resulting from contact with stakes must be guarded against, and the first signs of disease or insects should bring the cultivator to the rescue. When young trees are in full bearing, judicious thinning of the crops will demand attention, and if the trees fail to bear from excessive vigour, root-pruning or lifting are laborious but usually effective remedies. The spraying of fruit-trees is so important a matter that it is treated upon in a separate chapter.

One other point only in connection with established orchards and fruit plantations need be referred to here, and that is the removal of trees or bushes where close planting has been adopted with a view to subsequent thinning. If this is deferred too long not only are the surplus trees injured, but the permanent ones also suffer to such an extent that no after-care will restore them. It is a matter that is too often overlooked, to the serious loss of the cultivator.

Improving Old Orchards.—There are many old orchards throughout the kingdom which would admit of only one kind of profitable improvement, and that would be their total destruction. Decayed, cankered, insect-infested specimens may be very picturesque when laden with moss and lichen, but they are painful objects for a cultivator to contemplate, and if he should be expected to restore them to health and usefulness he is deserving of sympathy. There are, however, thousands of acres of orchards that would admit of improvement, and difficult though the task might be, the labour would under some conditions be well repaid. If the trees are badly diseased and decayed, they are best removed and burnt, root and branch. If they possess some degree of health, but the varieties are worthless, they may be cut down and regrafted with approved sorts, and serviceable trees may be obtained with due attention to the routine cultural requirements. On the other hand, a fully-developed Apple-tree may be valuable, and worth while to try what care will do in the way of restoration. Many such trees present a thicket of entangled and intercrossing branches, depriving each other of light and air. To reduce these branches to something like order often necessitates the removal of the greater portion. The branches should be sawn off cleanly, the surfaces smoothed where possible with a knife, and then lightly tarred. The next point is to wash or spray the trees thoroughly for the destruction of insect pests and the cleansing of the bark. Both operations can be readily performed even with large trees if the necessary appliances are at command. Finally, the restoration of the food supplies in the soil must be considered, as where a tree has occupied the ground for half a century, during a large portion of which time it has been neglected, the principal available constituents of the soil have probably been exhausted. If the trees are in grass, take an area corresponding to the spread of the branches, clear off the grass, and give this a liberal dressing of stable

manure. Where there are tanks in a stable-yard for the collection of the drainings, dilute this with about four times its bulk of water, and apply it at the rate of 50 or 60 gallons at a time when the soil is moist in early summer. Where the trees are not in grass the manure can be lightly dug into the surface, and the liquid may be supplied as in the other case. Should the trees fail to respond to this treatment, add a dressing of superphosphate of lime and sulphate of potash or other similar mineral manures. In many instances within our experience most gratifying results have followed persevering attention of the character advised, though it is naturally a more pleasing task to plant a new orchard than attempt to restore an old one.

The gathering of fruit, the storing, packing, or marketing, do not come within the scope of this chapter, but are dealt with fully in other portions of this work. [R. L. C.]

CHAPTER III.

SPRAYING FRUIT-TREES.

The devastation amongst fruit-trees caused by insect and fungus pests has been serious during the past quarter of a century. The

causes of this are various. The trees may be weakened and predisposed to attacks by the excessive use of stimulating manures, by over-cropping, or by poor cultivation. Careful selection of sites, planting only healthy young trees, and good cultivation are the best preventives. Still, even where these are provided, atmospheric and other conditions may prevail which favour the development and increase of both insects and fungi, and organized methods of prevention or cure become necessary. The adoption of such means is now compulsory in some countries; the careless cultivator who allows his trees to become infested without an effort to check the evil is regarded as a source of public danger, and is dealt with accordingly.

Important assistance has been rendered to cultivators by the invention of improved apparatus for the distribution of liquid substances over trees and plants. The ordinary syringe which has long been used in gardens is both wasteful and inefficient for the purpose, and the majority of garden-engines or hand-pumps are almost as unsatisfactory. When, however, the various forms of spray-nozzles were introduced, and the knapsack-machines came into use, both economy and efficiency were secured. With knapsacks of the "Eclair", "Notus", and "Antipest" types any liquid insecticide or fungicide can be easily distributed over small

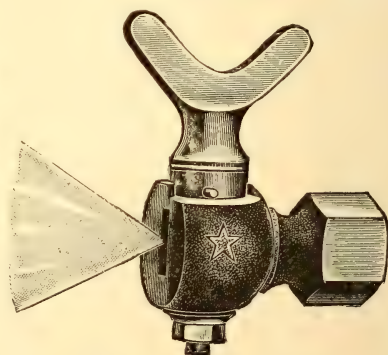
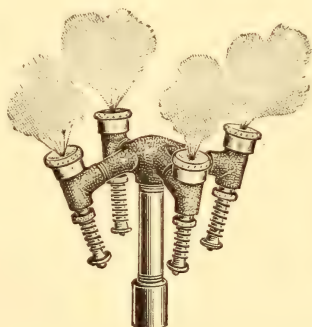
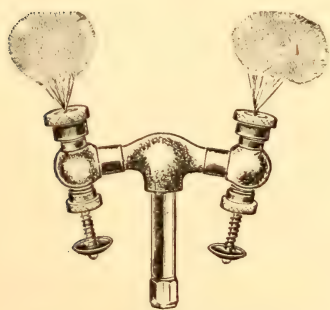


Fig. 836. — "Vermorel" Two-discharge Nozzle.

Fig. 837. — "Vermorel" Four-discharge Nozzle.

Fig. 838. — "Masson" Spray Nozzle.

trees, both on the upper and under surfaces of the foliage, and a man with one of these machines strapped on his back can effectually spray hundreds of trees in a day.

In the ordinary form of knapsack the reservoir, which is of thin copper, will carry three gallons of liquid, and the whole machine, when full, weighs about 35 lbs. It is furnished with a pump and agitator which are both worked by the same action, and the object of the latter is to ensure the thorough mixing of the solution while in use.

This is forced into a small chamber, and thence through a perforated cap or nozzle in a finely-divided spray. The regulation of the fineness is provided for in most of the knapsacks used in this country by nozzles having different-sized apertures which can be removed or affixed as desired, but in one form in use in America and Canada this can be regulated by a small T-shaped tap on the nozzle itself. Forms of nozzles for affixing to hose-pipes are shown in figs. 836, 837, and 838. Fig. 836 represents a "Vermorel" nozzle with two discharges, each

fitted with a "degorgor" to clear the chamber and aperture of any temporary obstruction. This furnishes a conical and fine spray for small trees. Fig. 837 shows another "Vermorel" with four discharges similar in construction to the last. Fig. 838 depicts the "Masson" Spray Nozzle, which is furnished with a tap to regulate the fineness of the spray, and which is also used for shutting off the stream entirely when desired.

With brass and india-rubber pipe connections of sufficient length it is possible, with good knap-

sacks, to spray fruit-trees thoroughly up to the height of 10 feet; they are therefore specially adapted for bush or pyramid trees. For standards and larger trees more powerful machines are required. They can be had now as barrels on wheels, to be worked by one or two men, or in still larger sizes to be drawn by horses, the capacity of the reservoirs being from 50 to 100 gallons (or more), and the pumps having a power equal to the distribution of the liquids over the largest orchard trees.

Useful portable forms of spraying apparatus for plantations of small trees are illustrated in figs. 839 and 840. Fig. 839 represents the "Standard" Spray Pump, which is adapted for

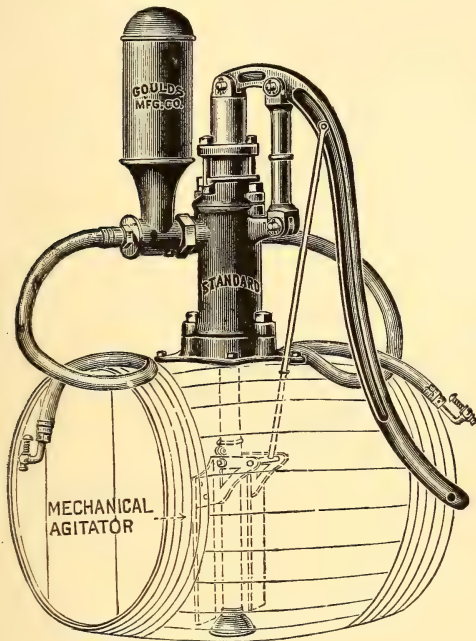


Fig. 839.—"Standard" Spray Pump.

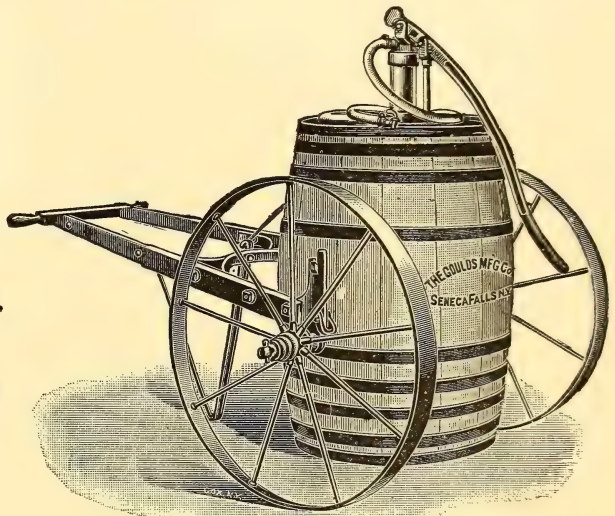


Fig. 840.—"Pomona" Barrel Spray Cart.

fixing to any convenient form of wheeled carriage, so that it can be readily moved from place to place as the work proceeds. The pump-handle is furnished with a bar connected with an "agitator" in the barrel (shown in outline), by means of which the pumping action also ensures that the substances being used are kept in an even state of diffusion. This form has an additional air-chamber on one of the discharge spouts, by which a continuous spray is maintained, and it can be had fitted with two lengths of hose or with one, as desired. The pump is also formed so that it may be inserted in the barrel as shown in the illustration, or with the base resting on either of the ends. In fig. 840 another convenient form is depicted, namely, the "Pomona" Barrel Spray Cart. The principle of this is similar to the preceding, *i.e.* it has a powerful lever-pump with agitator and air-chamber; the latter is of steel with the work-

ing parts of bronze without leather packings, and the essential parts are easily accessible for renewal or repair. The barrel is swung on a light truck frame with iron wheels and broad tyres.

There are also pumps that can be fixed to any ordinary strong barrel holding 20 or 30 gallons. Most of the larger machines are constructed to discharge from at least four sets of hose at the same time, thus greatly facilitating the work. The more powerful and best-made garden-engines can be utilized for the same purpose, as, with a suitable pipe attached, any form of nozzle can be fitted to them. For large trees and some infestations greater force is essential than can be obtained in the ordinary knapsack, and then these hand-engines are very useful.

For spraying large orchard trees the "Kero-water" (fig. 841) is a useful machine which is

especially designed for efficient distribution of petroleum emulsions or mixtures. It is fitted with two pumps worked by one lever, petroleum and water being pumped separately from different tanks (within the barrel) and discharged together thoroughly blended. By an ingenious contrivance the percentage of oil can be increased or diminished, the removal of a pin on the lever



Fig. 841.—First Spring Spraying. Gould's "Kerowater" Spring Pump at work.

effecting this by altering the length of the stroke. The oil-pump can be removed when the machine is required for ordinary spraying with solutions.

For the distribution of insecticides or fungicides in the form of dry powder (which is important in some cases) there are machines constructed on the bellows principle, *i.e.* the alternate indrawing and expulsion of air. One of the best of these is the "Coronette". This is like the knapsack machine for liquids, and is carried on the back of the operator in the same manner, the handle working the bellows, the powder being expelled through a metal tube with the mouth formed as a distributor.

Winter Dressings are recommended as a preventive measure against fungus and insect attacks on fruit-trees. When the trees are in a dormant state powerful remedies can be applied with safety which at other seasons would be injurious. The cleansing effect alone is valuable, for when the bark is covered with a dense growth of lichens and other minute forms of plant life, not only is the health of the tree directly affected, but they afford protection to innumerable insects, their larvæ, or their eggs.

A simple and inexpensive wash for winter dressings is caustic soda (sodium hydrate) dissolved in water at the rate of about 2 ozs. to 1 gallon of water for small quantities, or 2 lbs. to 10 gallons for large, this being nearly equivalent to what is termed a 2-per-cent solution. It should be sprayed on the trees during the winter as weather permits, avoiding times when frosts or strong winds prevail. If more than one dressing be applied, the last should be given shortly before the buds expand. We have found it an advantage to add 1 to 2 ozs. of soft soap to each gallon of water, as it causes the solution to adhere to the bark of the trees better, and thus increases its efficacy while adding little to the cost. Whenever soft soap is used for admixture with other solutions it should be dissolved in a little hot water first, and then added to the principal liquid.

A winter dressing that has been strongly recommended by the authorities at the Wye Agricultural College, Kent, consists of 1 lb. of ground commercial caustic soda, $\frac{3}{4}$ lb. pearlash (crude carbonate of potash), and 10 ozs. of soft soap to each 10 gallons of water. This solution, with the addition of pearlash, is more destructive to the eggs of many insects than when the soda is used alone.

In the application of all caustic and poisonous washes to trees two points should be remembered: one is, that the efficiency of the wash chiefly depends upon the substance being evenly distributed over the whole of the infected surface, whether bark or foliage; the other is, that due precaution should be taken to protect the clothes and body of the operator. Work as much as possible to the windward of the trees if there is a breeze, protecting the hands with leather or india-rubber gloves if the spraying is to be done with the stronger mixtures. A suit of oilskin, such as is worn by sailors, would be an efficient protection.

The application of insecticides and fungicides to trees in growth requires care and forethought if they are to be effective and at the same time harmless to the trees. As a rule, the spraying should be done when the bark and foliage are moist, or, if the weather be bright, in late afternoon. The surface should be thoroughly moistened without there being sufficient to drop.

As many of the substances used cannot be reduced to a state of complete solution to ensure a thorough mixture, it should be well

stirred each time the knapsack or engine is filled. The strainers with which all spraying machines should be furnished must have extremely fine meshes, and all liquids must be passed through them before use, otherwise the nozzles will be continually blocked and cause endless trouble.

Insecticides must either kill the insects immediately by contact, or poison them through their food. For the former it is difficult to find a compound that will destroy the pests without injury to the plant. The insects which infest plants can be classed in two groups, namely "sucking" and "biting" insects, indicating roughly both the habits of the pests and the best methods for their destruction. The sucking insects comprise those that absorb the juices of the foliage, as the numerous form of aphids, red spider, &c.; while the biting insects include those which consume the leaf itself, as the hosts of caterpillars and other larvæ.

The direct method should be employed for the sucking insects, for the destruction of which petroleum (paraffin), particularly in the form of an emulsion with soft soap, is extensively used. Where injury to foliage has resulted from its use this has been traceable to neglect of ordinary precautions. One of the simplest preparations we have tried is the following:—Dissolve two quarts of soft soap in a gallon of hot water, and while it is still warm add a quart of petroleum, stirring the whole together, preferably with a hand-syringe. To this add 20 gallons of soft water. This mixture is destructive to aphides of all kinds, while with the addition of about 2 ozs. of liver of sulphur the efficacy of the wash against red spider is increased.

Quassia extract with soft soap is also largely used against sucking insects, but it varies in its effects, and is not so reliable as the petroleum mixture. The Quassia mixture can be obtained ready for use on a small scale, but for extensive work it is cheaper to make it. The Quassia chips should be first steeped in enough cold water to cover them for two hours, and then boiled for ten hours, adding 10 lbs. of chips to each 10 gallons of water, which can afterwards be diluted to 100 gallons; to this, $\frac{1}{2}$ lb. of soft soap for every 10 gallons is added, previously mixed as already directed.

The indirect method, *i.e.* poisoning the food of the pests, is applied for the multitude of "biting" insects which soon render the trees leafless or injure the fruits if unchecked. For this a mixture of Paris green and lime in water

is used, and notwithstanding occasional injuries to the tree foliage, it is one of the most effective. It is a powerful poison, and therefore great care is required in handling it. It is sold both as a powder and as a paste, the latter form being preferable in all respects, and this can be employed at the rate of $\frac{1}{2}$ lb. with 1 lb. of fresh lime to each 100 gallons of water. The Evesham Committee of fruit-growers a few years since recommended the use of "1 oz. of Paris green to 8 gallons of water for growing foliage, or 1 oz. to 6 gallons of water when the foliage is matured". The weaker mixtures, however, are usually effective, and are less likely to injure the trees. It should be impressed upon operators that Paris green does not dissolve in water, and therefore requires frequent agitation to keep it thoroughly mixed. Owing to its poisonous nature it must not be sprayed over fruit blossom, or the bees will be killed; nor over fruit within a few weeks of the time for gathering it. The best time for the first application is immediately after the flowers have set and when the young leaves are expanding, and subsequently as occasion demands until the fruit is approaching maturity.

London Purple, a somewhat similar poison to Paris Green, varies more in its composition, is more uncertain in its effects on insects, and more frequently injures the foliage. Its advantages are that it is very finely divided and more easily mixed. It can be used at the rate of 6 ozs. of London Purple and 12 ozs. of lime to 100 gallons of water.

Arsenate of lead has been tried in America with satisfactory results as a destroyer of caterpillars. It is prepared by mixing from 1 to 2 lbs. of the arsenate with 150 gallons of water. Extremely useful mixtures can be made with this and petroleum emulsion, or with Bordeaux mixture, thus securing a wash containing the properties of several.

Fungicides.—The only fungicide in general use on a large scale for fruit-trees and orchard spraying is the Bordeaux mixture, and this is most efficacious. The mixture used consists of 12 lbs. of copper sulphate and 8 lbs. of quick-lime to 100 gallons of water. The copper sulphate is placed in a coarse canvas bag and suspended in the water to dissolve gradually, the fresh lime is mixed with water to form a paste, and is then added. Another form is that in which copper sulphate, lime, and treacle are mixed at the rate of 10 lbs. of each to 100 gallons of water; the treacle causes the liquid to adhere to the foliage. Soft soap is occasionally substi-

tuted for treacle, or, instead of either, $\frac{1}{2}$ lb. of Paris Green per 100 gallons can be added to the copper sulphate and lime, and will constitute a valuable combined fungicide and insecticide, the lime in the Bordeaux mixture rendering the Paris Green quite innocuous to the leaves.

Bordeaux mixture should be applied in advance of fungus attacks or at the first signs of disease, as it is essentially a preventive. Where fungus diseases have been prevalent in the previous season, winter dressings should be applied two or three times, especially just before the flowers expand and again when they have fallen. For all leaf diseases, and for the scab which attacks both leaf and fruit in the Apple and Pear, the Bordeaux mixture is a most useful dressing; but in the case of some fungus diseases, which have two stages of existence on different host plants, it is essential that the original source be discovered if the disease is to be exterminated.

Another useful fungicide is the ammoniacal solution of carbonate of copper, which can be formed according to the American plan by dissolving 5 ozs. of carbonate of copper in 3 pints of strong ammonia, and then adding to 45 or 50 gallons of water. It is especially useful as leaving no sediment on the fruit. Potassium sulphide or liver of sulphur is a useful fungicide, used at the rate of 1 oz. to from 5 to 10 gallons of water, with the addition of soft soap. The reader should also consult the chapters on "Insect Pests" and "Fungus Diseases".

[R. L. C.]

CHAPTER IV.

THE APPLE.

EVOLUTION OF THE APPLE—SYSTEMATIC IMPROVEMENT—FLOWERING PERIODS—INTERPOLLINATION AND FERTILITY—GENERAL CULTURE—SITUATION—ALTITUDE—ASPECT—SOIL—PREPARATION OF THE SOIL—SELECTING TREES—STOCKS AND THEIR EFFECTS—THE AGE OF TREES—TIME TO PLANT—DISTANCES FOR TREES—MARKING THE STATIONS—STAKES—SIZE OF HOLES—TREATMENT OF TREES ON ARRIVAL—PLANTING—APPLES FOR MARKET.

The Apple takes first rank amongst the more important hardy fruits cultivated in the United Kingdom, and owes its high position to many valuable qualities. In hardiness it is unsurpassed, for, as regards the larger number of varieties in British gardens, it is rare that the lowest temperature experienced ever affects the trees themselves to any serious extent. In very low situations, and in seasons when the minimum

temperatures have fallen to near the zero of the Fahrenheit scale, we have known occasional instances of bark injury resulting, but this has been confined to a few varieties and generally to trees on unsuitable stocks. Even in the spring, frosts seldom damage the young foliage, though unfortunately we have not yet secured a race of Apples with flowers that can resist frost.

The Apple can be grown with a fair measure of success over a greater area of our country, and in a greater variety of soils and situations, than any other fruit-tree, though its best qualities and fullest capabilities are only developed under special circumstances of soil and climate.

Then, too, the season during which the fruits can be had for use extends throughout the whole year, no other fruit being so easily kept in a fresh state for six to nine months, and at the same time retaining all its characteristic properties.

Though the Apple in its different forms does not present such a variety of rich aromatic flavours as the Pear, yet there is a wide range of variation in degrees of sweetness and acidity, as well as in flavour and other characters. In appearance the Apple is unequalled in form and colour variations, which alone would render the fruit an interesting and delightful study.

From a utilitarian or commercial point of view also the Apple is highly important. The rapidly extending and well founded appreciation of the fruit as an essential part of the food of the people, has led to an enormous increase in its cultivation in temperate climates, and there appears to be every probability that for many years to come this extension will be continued. The safety with which the fruit can be packed and transported long distances by road, rail, or sea, has aided the advance in this respect, and increased facilities in the future will still further help in the same direction.

In seasons of great abundance drying Apples for home use or export has become a great part of the fruit-preserving industry in America. It has also been tried here when prices were very low and the markets glutted, but as a rule the demand for fresh Apples is sufficient to render this method unnecessary. The usual form in which the dried fruits are stored or sold is that of Apple rings, which retain the flavour well and are readily prepared for use.

Several machines are in use for the purpose of paring, coring, slicing, and drying or evaporating Apples, and serviceable forms which have been tried in Great Britain, as well as on the

Continent and in the United States, are shown in the illustrations figs. 842 and 843. Mayfarth's Apple parer, corer, and slicer is a simply

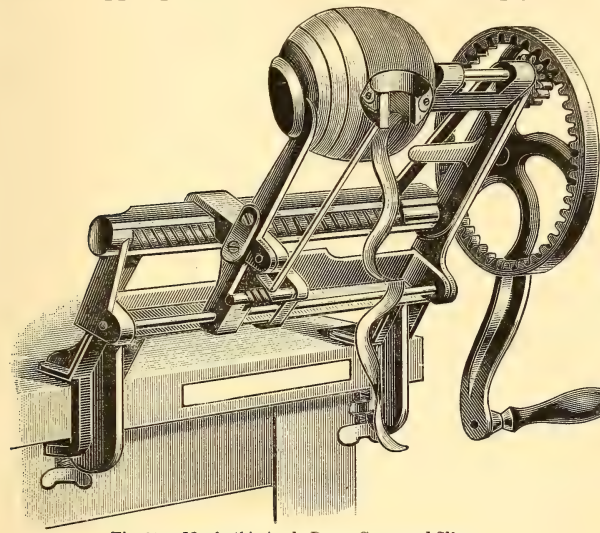


Fig. 842.—Mayfarth's Apple Parer, Corer, and Slicer.

constructed appliance which can be readily affixed to the edge of a table or bench, the operations of removing the peel and core being

effected in succession after the fruit is placed in position, by turning a handle at the side, the slicing being then performed by another simple action. The fruit is then sulphured or dipped in salt and water, and is ready at once for the drying-machine. Mayfarth's American Evaporator (fig. 843) has been subjected to several trials in England, notably at the Royal Horticultural Society's Gardens, Chiswick, and has given satisfactory results both in efficiency and economy of fuel when carefully managed. It consists of a stove and a series of trays upon which the Apple rings are arranged, and through which hot air is passed until desiccation is sufficiently effected to ensure the keeping of the fruit when properly stored.

Another form of evaporator, the "Geisenheim Fruit and Vegetable Drier", was employed in the Royal Agricultural Society's demonstrations at Leicester a few years ago, and the same machine is now in use at the Woburn Experimental Fruit Farm. In this the principle is similar to that in the

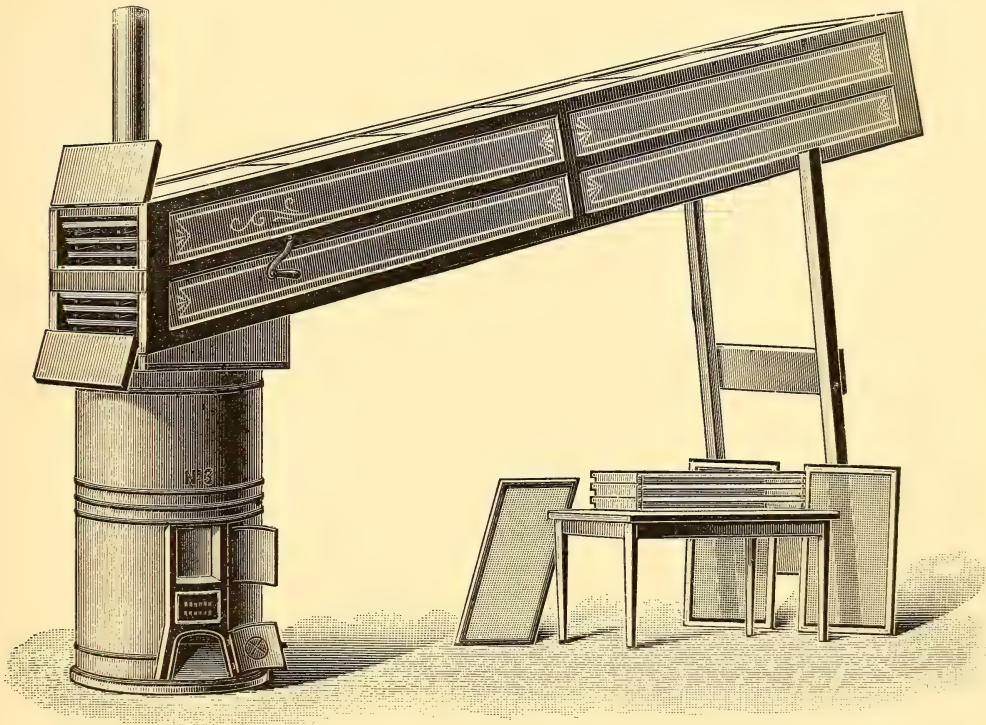


Fig. 843.—"American" Evaporator.

Mayfarth Evaporator, but the trays are arranged immediately above a hot-air chamber.

The utilization of Apples for the production of jelly on a commercial basis is extending, and

several flourishing enterprises have been started for this purpose in recent years. There is also a partial revival of cider manufacture in some districts. Greater attention is being paid to

the matter, improved systems are in operation, the cider is presented to the consumer in a more pleasing form, and the better brands are decidedly superior to many of the cheap foreign wines.

In short, the Apple merits all the attention that can be accorded to it, whether it be grown simply for home consumption or for general commercial purposes, and we purpose in the course of this chapter to review the aspects of the subject which most concern the cultivator generally.

Evolution of the Apple.—The origin of the innumerable varieties of cultivated Apples is attributed to the Common Crab—*Pyrus Malus* (fig. 844)—still found wild in many districts of Great Britain, and having a wide distribution



Fig. 844.—Crab Apple (*Pyrus Malus*). (½.)

throughout the temperate countries of Europe and part of Asia. There is evidence that it has been used as food and cultivated by man for upwards of four thousand years, and specimens of the dried or carbonized fruits have been found in the lake dwellings of central Europe dating from prehistoric times. Where the first varieties and the first cultivation commenced is not known, but the evolution of the Apple as we know it has been a long and gradual process. The wild Crab of our hedgerows does not vary so much in its fruits as it does in its habit and vigour of growth, though in some districts in England a distinction is made by the country people between Crabs and Crab-Apples, the latter being regarded as a larger type. Some differences of this kind are, however, no doubt due to accidental advantages of soil or situation. In raising seedlings for stocks from the Crabs gathered in the hedgerows it is remarkable what surprising diversities of growth

are obtained, indicating the capacity for variation which exists in the plant. The average size of the wild fruits found at the present time in Great Britain is from 1 inch to 1½ inch in diameter, and this does not differ materially from the size of the Apples found amongst the remains of the Swiss lake dwellings. We have seen a marked improvement in the fruit of the Crab in one generation, from the seed of a wild type, when grown under favourable conditions. There is no doubt that we owe the greater number of the finely developed and varied Apples of the present time to selection, at first slow, but which within the past two hundred years has been considerably accelerated by the increased number of breeders and cultivators.

Until grafting and budding became the general method of propagation for the Apple the usual means was by seed. At the present time there are thousands of old seedling Apples scattered about the country which originated in this way, many of which have been perpetuated locally. Some of these are good and distinct, but the majority are either worthless or not superior to others in general cultivation.

A glance at the list of old varieties will show that nearly all, to within recent times, were practically chance seedlings of unknown origin. It has been claimed that the Api or Lady Apple, now so much grown in America, and frequently seen in London shops in neat little boxes, is the oldest Apple in cultivation, as it is believed to have been known to the Romans. Continental pomologists dispute this, however, and state that it was found as a wildling in the forest of Api in Brittany, and that it was so recorded early in the seventeenth century. The Old English Pearmain was regarded by the late Dr. Hogg as "the oldest English Apple on record", as it was cultivated in Norfolk before the year 1200, though nothing is known of its origin. The Costard was probably contemporaneous, as it was known before 1292. Next amongst the ancient Apples must be placed the London Pippin, which was in cultivation prior to 1580, while in the seventeenth century the best known were the Catshead, the English Codlin, the Golden Pippin, Golden Reinette, the Joanneting, the Pomewater, the Summer Pearmain, and the Winter Quoining, concerning the origin of which nothing whatever is known, though they were all doubtless seedlings selected for their marked characters. Some of the above are still grown in gardens, but there are many others of our best-known Apples which have come to us in a similar way, such, for instance,

as Ribston Pippin, Blenheim Pippin, Dumelow's Seedling, and Devonshire Quarrenden, which have no recorded parentage, while Claygate Pearmain is said to have been found in a hedge, Keswick Codlin on a rubbish heap, and Cornish Gilliflower in a cottager's garden. In a few cases the name of the seed parent is known, as for example, Cox's Orange Pippin is from Ribston Pippin, Worcester Pearmain from Devonshire Quarrenden, and Waltham Abbey Seedling from Golden Noble. Many more could be given, but this will suffice to illustrate that the advance of the Apple has been chiefly due to chance seedlings and selection rather than to any deliberate attempts to secure better varieties.

Systematic Improvement of the Apple.—Raising seedlings, even from varieties of proved merit, is an uncertain task; the prizes are few and the blanks many. We cannot rely upon perpetuating any good qualities the parent tree may possess, but we can be sure of having a large proportion of seedlings that are utterly worthless. It is slow and unsatisfactory work, and the improvement of so valuable a fruit as the Apple deserves more systematic and scientific treatment. It may be said: Why seek to obtain more varieties when there are too many at the present time? Varieties of poor quality, or those with insufficiently marked characters, are indeed too numerous, but we have not too many good Apples, and there is still room for material advance in the right directions. Thus early Apples of better quality are required, the productiveness and constitutional strength of many shy and weakly varieties of high merit could be improved, first class, richly flavoured, late-keeping dessert sorts are not too numerous, and might well be increased. The flavours of the fruits could also be diversified. In fact, there is plenty of work for those who have the time, the opportunity, and the desire to do it.

Thomas Andrew Knight, at the end of the eighteenth and the beginning of the nineteenth century, set an admirable example to horticulturists in the systematic improvement of fruits, including Apples, but until comparatively recent years very little has been done on the same lines. Mr. Knight feared that the old varieties of Apples were dying out owing to repeated propagation by grafting and budding, and he sought to obtain a re-invigorated race by calling in the aid of the varieties that approached more nearly to the original stock. In several instances

vigorous, hardy-constituted, and fertile forms resulted, but they could only rank as high-class Cider Apples. The most notable of these were the Siberian Bittersweet and the Siberian Harvey, both of which originated in crosses between the Yellow Siberian Crab and Golden Harvey or Brandy Apple, the latter being the pollen parent. Foxley was another of the same type,



Fig. 845.—Siberian Crab (*Pyrus baccata*). (3.)

and resulted from a cross between the Scarlet Siberian Crab *Pyrus baccata* (fig. 845) and the Golden Pippin. If these crosses had been extended to another generation or two, some remarkable results might have been obtained. The best of Mr. Knight's other seedling Apples are Downton Pippin from Isle of Wight Orange Pippin fertilized with Golden Pippin (Yellow and Red Ingestrie are from a similar cross), and Bringewood Pippin from Golden Pippin crossed with Golden Harvey.

Not only was the principle of systematic cross-fertilization thus introduced amongst fruits, but the greatest care was adopted to prevent self-fertilization, by removing the stamens from the seed parent before the anthers were mature. It is also essential that the flowers be protected by small muslin or paper bags before and after

the pollen is applied. Whatever is employed for protection must be light and translucent, and be removed immediately the fruit is set, or failure will result.

A few good Apples have been recorded from direct crossing since Knight's time, such as Sturmer Pippin, raised at Sturmer in Sussex from crossing Ribston Pippin with Nonpareil. The late Mr. Thomas Laxton also commenced crossing amongst Apples, but his attention was diverted to Strawberries before he had accomplished very much, though several of his seedlings are still in cultivation. In more recent times Mr. Charles Ross, Welford Park Gardens, Newbury, has done some systematic crossing



Fig. 846.—Hybrid Crab Apple—Leopold de Rothschild (John Downie Crab × Cox's Orange Pippin). (3.)

with the result that several seedlings appear likely to take a high place, such as Mrs. Phillimore from Cox's Pomona and Mr. Gladstone, and Charles Ross (see Plate) from Cox's Orange and Peasgood's Nonesuch. Messrs. J. Veitch & Sons have also turned their attention to the improvement of Apples, and already they have fruited several remarkable seedlings, such as Langley Pippin from Mr. Gladstone crossed with Cox's Orange, and Leopold Rothschild (fig. 846) from John Downie Crab crossed with Cox's Orange. The latter is a similar experiment to some of those tried by Knight, and the resulting cross has small fruits very freely produced, and it is both ornamental and useful. If this is again crossed with other Apples a distinct and valuable type may be produced.

In the United States Experimental Stations systematic work is being performed with the native Crabs and the Apple, and the results so far achieved were thus referred to by Prof. L. Bailey, of the Cornell University, at the Royal Horticultural Society's Hybridization Conference

in 1899:—"The Prairie States Crab (*Pyrus Ioensis*) has hybridized with the common Apple, producing a race which has been described as a species. These hybrids promise something of the mid-continental region. But perhaps the largest crossing experiments ever made in North America is in the amalgamation of various races and varieties of *Pyrus Malus*, in the hope of securing adaptable varieties for the western Mississippi valley and the cold North. The Russian races of Apples and the Siberian Crab (*Pyrus baccata*) are some of the stocks which have been used. Budd long ago began this crossing work, and some of the seedlings are now bearing at the Iowa Agricultural College.

To give an idea of how extensively this work is prosecuted, I may say that Craig made over 5000 Apple crosses in Iowa in 1899. For one thing a man was sent to Arkansas, a distance of 500 miles, to collect pollen of given local varieties, and this was used on the Iowa flowers. This work is systematized between the Iowa Experimental Station and the fruit-growers of the State."

Besides the improvement of the fruit, which is of course the most important object, in crossing attention should be given to securing robust habit, a disease-resisting constitution, and early fertility. It might be possible to obtain varieties whose flowers were better able to withstand frost, either by changing their time of flowering or from the form and texture of the flowers themselves. That considerable differences in these respects already exist amongst the Apples grown at the present time, comes within the knowledge of cultivators who have had large numbers of varieties under their care, but it is seldom accorded the attention it deserves. Several varieties with large flowers and petals of thick substance, especially if these are turned in somewhat, or cupped at the points, are good frost-resisters. An example of this is furnished by Stirling Castle, which on many occasions within our own experience has been exposed to considerable frost at flowering time, but has escaped with few losses, while other varieties in the same situation have had the whole of their flowers destroyed.

Flowering Periods.—The time of flowering differs greatly amongst the varieties of Apples, and although this is affected by situation and climate, an approximate order is kept. Three groups may be formed according to the time at which the flowers are fully expanded—namely:

1. early, 2. midseason, 3. late; and as regards a large part of central and southern England, these periods roughly correspond to the dates: May 1st to 8th, 9th to 16th, and 17th to 24th, with local variations as earlier or later extensions of these times. A few examples in each may be given from our own observations over a wide area, but it is impossible to arrange the varieties in exact order:

1. *Early.*

Keswick Codlin,	Hanwell Souring,
Irish Peach,	Flower of Kent,
Tower of Glammis,	Golden Spire,
Duchess of Oldenburg,	Hubbard's Pearmain.

2. *Midseason.*

Lord Suffield,	Baumann's Red Reinette,
Warner's King,	Dutch Mignonne,
Devonshire Quarrenden,	Sturmer Pippin,
Kerry Pippin,	Bramley's Seedling,
Manks Codlin,	Royal Russet,
Emperor Alexander,	Cellini,
Yellow Ingestrie,	Norfolk Beefing,
Scarlet Nonpareil,	Lord Grosvenor,
Stirling Castle,	Minchall Crab.
Adams' Pearmain,	

3. *Late.*

Blenheim Pippin,	Lord Derby,
Worcester Pearmain,	Ecklinville,
Cox's Orange Pippin,	Annie Elizabeth,
Dumelow's Seedling,	Alfriston,
Margil,	Golden Noble,
Cox's Pomona,	Lady Henniker,
King of the Pippins,	Northern Spy,
Fearn's Pippin,	Court Pendû Plat.

Interpollination and Fertility.—Another matter in reference to the fertility of Apples is receiving more attention now than formerly, especially when forming large plantations, as the occasional defective pollen supplies can be remedied by pollination from other varieties. If the sterility arises from insufficient or unsuitable soil-food the remedy is a cultural one, which will be discussed later in this chapter; but where it is peculiar to the variety other means must be adopted. The subject is closely connected with one of great interest, *i.e.* the influence of foreign pollen on the formation of fruit. Instances have been recorded at intervals within the past 150 years of such supposed influences having been noted in Apples, Pears, Melons, Cucumbers, Peas, Maize, The Egg Plant, Liliun, Orchids, and other plants; and though most of the observations may be open to question, a few are worth notice. Perhaps one of the most remarkable is that recorded by Thomas Meehan of Philadelphia, to the effect that "the bough of a Pear-tree, which had always been altogether

unfruitful, projected into the boughs of a neighbouring Apple-tree, fruits were produced which in skin, flesh, and other respects were altogether Apples, and had only the seeds, carpellary partitions, and stalks of the Pear".

The practical bearing of this was shown by a gardener, who had come to the conclusion from experience that it is a mistake to plant large areas of one kind of Apple only. He had found that better and more regular crops resulted from mixed plantations, or where the varieties were planted alternately. A high authority in the United States says: "There is little positive knowledge concerning the interpollination of fruits, and no subject connected with pomology is in greater need of study. We chiefly know that the most productive orchards are usually those of many varieties, and that some varieties sometimes refuse to fertilize themselves. The safest practice, therefore, is to plant no more than two rows of any one variety together in fruits in which (like many Apples and Pears) self-sterility is often apparent." This may not be so generally applicable to plantations in this country as to those in America, where sterility is more often set up in fruits, but it is well worth attention, and cases do occur where trees flower freely yet produce no fruit, and defective pollen supplies is sometimes one of the causes. Instances have been observed where advantageous results followed from proximity to such free-flowering Apples as Stirling Castle, Lord Grosvenor, Seaton House, and others. A few hives of bees also help interpollination, some growers who have been successful in hardy fruit culture attributing their good fortune in securing regular crops of even fruits partly to the assistance rendered by bees.

General Culture.—The Apple grows and fruits under so many different conditions of soil and climate that the limits to its adaptability appear to be widely placed. Unfortunately, this elasticity of constitution has led in some districts to a course of neglect which now shows serious effects. All earnest cultivators must desire the highest possible results that intelligent care can ensure, and the Apple is worthy of the best efforts. Every detail should have the fullest consideration, for even with the closest study there are always sufficient difficulties to contend with and problems to perplex when dealing with plant life. In British gardens the greatest success has been attained in the cultivation of the Apple, yet examples of failure can usually be found very near them, just as in some of our

largest markets the finest fruits may be seen almost side by side with others comparatively worthless. Experience throws a light on many divergencies in results, and teaches that success in fruit culture is largely dependent upon attention to details that at first sight often appear unimportant.

Situation.—Where the site for a garden has been selected with judgment, there should always be ample provision for the satisfactory culture of the Apple as well as of other fruits. But we have here to consider the special requirements of this fruit alone, and the chief preliminary matters demanding attention are the situation where the trees are to be grown, including altitude, aspect, climate, and rainfall, and the nature of the soil. Throughout the British Isles there is scarcely a district where the Apple cannot be grown, except where local conditions of exposure, soil, sterility, or excessive soil-moisture are prohibitory. From Caithness to Cornwall, in Great Britain, from Antrim to Cork, in Ireland, Apples take the leading place amongst hardy fruits.

Altitude.—The range is proportionately as wide in altitude. At the Royal Caledonian Society's Apple and Pear Congress in Edinburgh, examples of twenty-seven varieties of Apples were shown which had been grown at Monaltrie, Ballater, Aberdeenshire, at an elevation of 1350 feet above sea-level. Farther south there are many instances of successful Apple plantations at considerable elevations, one of the best known being that on Lord Rosebery's estate in Buckinghamshire, Mentmore, which has an altitude 650 feet. Grown on the higher elevations in the North of Britain the fruits are usually small and wanting in colour, while the dessert varieties are seldom satisfactory except with the protection of walls. The only extremes of altitude which are really dangerous to the Apple are in low inland districts where late spring frosts too frequently destroy the flowers, as they are also apt to do in valleys or near sluggish water-courses.

Important differences in temperature may often be caused by local conditions where the elevation is very slight. For instance, at the Woburn Experimental Fruit Farm there are two stations for meteorological observations, and the difference in the elevation is only 15 feet, yet at the lower station the minimum radiation temperature on the ground has occasionally been 5 degrees lower than that at the upper one. This means that with such a small difference in height, and within a distance of about 700 feet,

all prospects of a crop of fruit might be destroyed in the one place. The air temperature registered in stands 4 feet from the ground seldom shows such marked differences. Further reference to this matter and to air-drainage will be found in the chapter on Orchards.

Aspect.—The aspect of the site chosen for Apples usually has a much greater influence on results than either latitude or altitude—at least as far as the United Kingdom is concerned. Remarkable illustrations of this fact occur in many counties, especially in the north and along the east coast. A favourable slope of the land and a little shelter make more difference between two neighbouring situations than a hundred miles north and south. For example, at Dunrobin Castle, Golspie, in Sutherlandshire, Apples are grown with success although it is so far north; but the situation is open to the sea on the south and well sheltered on the north, north-east, and north-west side. Also at Skibo Castle, Dornoch, in the same county, Apples are satisfactory, but that also is well sheltered from the north. From both these gardens collections of good Apples, representing respectively twenty and sixteen varieties, were contributed to the Edinburgh Apple and Pear Congress. In each collection Devonshire Quarrenden and Stirling Castle were noted as of special merit. Yet in a large proportion of that and neighbouring counties in unfavourable aspects, Apple culture would not yield such encouraging results. Coming south some hundreds of miles there are gardens both on the east and west sides of this island where the aspect has not been well chosen in the respects named, and where the utmost efforts of the cultivator fail to produce as good results as have been attained in the north of Scotland under better local conditions.

An essential part of the conditions included in aspect is the slope of the land, as a slight inclination in a suitable direction often ensures Apples being cultivated in unfavourable districts. The preferable directions are south, south-east, and south-west, in the order named, the respective advantages of which are reviewed in the chapter on Orchards, where also the disadvantages of an eastern inclination are noted. A fall of 2 feet in every 100 feet is a good medium incline, if it is less than that the full benefit of the sun's heat and light is not obtained, and if it is greater other difficulties connected with too rapid surface drainage are introduced. On very steep slopes the terrace method of planting must be adopted, similar to



PEARS on wall, Royal Gardens, Windsor. CORDON APPLES by side of walk



PEARS on curvilinear trellis in Royal Gardens, Windsor

that in the Vine-growing countries of South Europe.

In the southern counties of England the northerly slopes may be utilized under some circumstances, but such are best suited for early cooking Apples, when it is desired to prolong the supply of those varieties. The chief difficulty is in securing the thorough maturation of the wood, so that health and fruit-bearing may be continued. For this reason the upper portions of such aspects, or a side open to the west, help somewhat by providing exposure to the sun's rays for a part of the day, though they necessarily reach the trees very obliquely.

Shelter is also important as already indicated, and further details will be found in the chapter on Orchards. It affects the trees in several ways and at different times. When the flowers are expanded, protection from high winds often means the saving of a crop, if no other adverse influences intervene. After the fruit is formed, and especially when it is approaching the ripening state, shelter is even more important; while there is the general safety of the trees to be considered.

Rainfall is a point that should have consideration, for the Apple thrives under moist atmospheric conditions, and an ample supply of moisture in the soil without stagnation is essential. The east and west counties of Great Britain differ greatly in the annual rainfall, without taking into consideration the exceptional records from high localities in Devonshire and Westmoreland. In the eastern counties of England there are many places where the yearly rainfall ranges between 15 and 20 inches, while near the western coast the average would be almost double these figures. This has a material bearing upon Apple culture, for in districts where the rainfall is from 20 to 25 inches success can be obtained in heavier soils than where the annual average is nearer 40 inches. On the other hand, in the region of heavy rainfall the trees can be grown in lighter soils than in the dry counties. This matter is too frequently overlooked, yet in selecting positions for large plantations it demands close attention. It often affords an explanation of the diverse soil-conditions under which Apples give good results.

Soil.—The majority of substantial loams and other fertile soils suited to the Apple contain ample supplies for the growth of the tree in its early stages, provided there be sufficient moisture present to render the various substances available to the roots. By chemical changes, and by the action of soil organisms, various

compounds are slowly reduced to a state in which they can be absorbed by the roots; and as far as growth only is concerned, this is usually sufficient. When fruit-production commences, a much larger additional strain is imposed upon the resources of the soil. From analyses at the Cornell Experiment Station (U.S.A.) it was determined that "five bushels of Apples remove in round numbers 11 lbs. of nitrogen, nearly 1 lb. of phosphoric acid, and 16 lbs. of potash, and that the leaves of a tree large enough to produce the Apples would contain 10 lbs. of nitrogen, nearly 3 lbs. of phosphoric acid, and 10 lbs. of potash". If the bearing of heavy fruit crops continues over a succession of years, there will be a gradual exhaustion unless the soil is very rich in the constituents named, or it receives the best cultivation with judicious manurial treatment. This distinction must be remembered, namely, that a soil which can ensure the development of a vigorous Apple-tree to fruit-bearing age, may yet prove unequal to the task of maintaining it in good condition over a long period of fruit-bearing when so much is being annually removed from the land.

It is evident, therefore, that the elements of fertility must either be present in considerable proportions, or sufficient must be added to compensate for what is being lost. The physical constitution of the soil and mechanical means of amelioration will exercise a material influence on the results. The water-retaining power of soils and the conditions favouring the even distribution of moisture are mainly dependent upon the coarseness or fineness of the particles, and upon the proportion of clay, sand, or humus that may be present. By the various operations of digging, trenching, and hoeing, some of these conditions can be modified to such an extent that the nature and productiveness of a soil can be greatly altered without direct manurial additions. The extremes most difficult to deal with are where coarse stony gravel, clay, or chalk forms a deep subsoil immediately below a thin surface soil. As regards the Apple, the first-named is the worst, and should be avoided whenever possible. Gravel forms an effective barrier to the circulation of moisture, as while rain passes away with great rapidity, there is little rising of water from below. In the case of clay and hard chalk, water circulation is very slow and ineffective in times of drought. With a good surface soil 2 to 3 feet deep the subsoil is of less importance, provided it be not of a nature to induce the

accumulation of water, and that of course can be prevented by drainage.

The consolidation of the soil has a bearing upon cultural problems. A hard condition checks root development and hinders free growth, but it has a tendency to induce greater subdivision of the roots, and in a degree may promote earlier fruit-bearing. In the opposite direction a loose condition of the soil encourages rapid growth, and if such a soil be rich as well, it often results in excessive growth with corresponding unfruitfulness.

Preparation of the Soil.—To prepare the ground properly, the directions given in treating of the formation of the kitchen-garden should be followed. If circumstances will not admit of their being carried out to their full extent, they should be kept in view, and acted upon as far as possible. If the ground requires draining, that should be seen to in the first place. It must then be well trenched, whether the plantation be of small or large extent, for in either case the trees will amply repay the trouble of the operation. In trenching let the good soil be thrown up where it is deep; let all inequalities which may then appear in the bottom of the trench be reduced, and when all is trenched over, the surface can either be levelled or made to form a regular slope or slopes, such as may be found to agree best with its general inclination. In wet or cold subsoils it has been recommended to plant the trees on the surface, or on raised mounds or ridges. This may succeed very well for a time, but ultimately the roots will go down after moisture if this should in some dry summers be deficient near the top. It is therefore a much better plan to drain the subsoil effectually, and thus render high planting unnecessary, so far as regards too much moisture at the root. A tree cannot thrive when the extremities of the roots are in a dry medium, even although the soil close to the stem may be moist in consequence of the tree being placed in a hollow. If, on the contrary, the soil at the root extremities be moist, it is of less consequence if it is dry near the stem.

Where the soil is light, and not naturally rich enough, it should be well manured. We do not wish to encourage over-luxuriance in any case, but a healthy vigorous growth should be promoted. If, consistent with this, a tree make annually twice the quantity of shoots and foliage that another does that is stinted of nourishment, the former will be able to bear double the quantity of fruit, although it may not be disposed to commence bearing at so early a period.

Instead of applying manure from the farm-yard in a fresh state, it is better to form it into a compost with a proportion of a soil that would by itself prove beneficial. Turfy loam will in all cases be suitable. The compost should be worked in as the trenching proceeds, and it should be placed chiefly between 1 foot and 2 feet below the surface. Some good compost ought to be reserved for mixing with the soil when planting the tree.

Selecting Trees.—Healthy young Apple-trees can be obtained in any quantity from the leading British nurseries. It is possible to secure trees of some varieties by thousands, even in size and moderate in price. Still, it is well



Fig. 847.—Standard Apple.

for all who are purchasing in large numbers to inspect the plantations themselves, and at least select a sample of what they require. The propagation of Apple-trees is seldom resorted to in gardens at the present time, except for the perpetuation of special varieties that are not readily procurable, or on large estates where trees are raised for the tenants. This part of the subject is reviewed later in this chapter as a needful part of the gardener's knowledge, but one which he is only called upon to exercise in special cases. The selection

of trees, the different forms of training and their particular merits, the character and advantages of the various stocks, are matters which come within the experience of all, and therefore demand prior attention.

The natural form of the Apple-tree, that which permits the fullest development and the greatest durability, is the standard on the Crab or free stock. For orchard purposes these are obtainable with clean stems 5 to 6 feet high from the root to the head; but for ordinary

tainly desirable, as if well grown and in suitable soil they will often continue bearing profitable crops for over 100 years. The value of a finely-developed Apple-tree that yields 20 bushels and upwards of good fruit can be easily estimated.

For gardens and plantations where early returns from the land are essential, and as a portion of an orchard of standards where livestock is not admitted, dwarf trees on Paradise stocks (fig. 848) are by far the most useful.

In any case of short tenancy it hardly pays to plant standard Apples, as though compensation may be secured at the termination of the occupancy for the then value of the trees, this does not represent the loss to the growers in the land they have occupied unprofitably as regards actual returns in the meantime. Either as bush or pyramid trees on suitable stocks, Apples will produce fine fruits in the second and third year, and with the best cultivation and attention the more robust can be relied upon for twenty to thirty years, and under very favourable circumstances for longer periods. For general purposes the dwarf Apple on the best English stocks is one of the most useful trees that can be grown. The bush form is naturally adapted to the habit of most varieties, and if grown with clean stems 1 to 2 feet high, handsome freely-branched trees can be formed in a few years. The pyramid form can be adopted with many varieties that naturally grow



Fig. 848.—Dwarf Tree on Paradise Stock.

planting, or at least where cattle will not have access to the trees, low or half standards, with stems 3 to 4 feet high, are often preferred. Usually these form their heads more quickly, and they are more convenient for cultural attendance. The main objection to standards in gardens, or wherever fruit is in urgent demand, is the length of time the majority of varieties in this form require before profitable cropping commences. Ten years or more will elapse with some varieties before fruit is produced in quantity, and Blenheim Pippin is a notable example of the extreme in this respect, as the above limits are sometimes exceeded. Some of the more prolific Apples reach a bearing state much earlier, such as Lord Grosvenor, which we have known to produce good crops when five or six years old. As a permanent plantation, and for the improvement of an estate where the future has to be regarded as well as the present, standard Apples are cer-

with a stout leading stem, but the Apple does not retain this form so well as the Pear. In addition to the early fruit-bearing, dwarf trees offer many advantages. They are convenient for pruning, for fruit gathering, for spraying and cleaning. A large number of trees can be planted in comparatively small spaces, and the produce of thriving fruitful dwarf Apple-trees has exceeded 500 bushels per acre in a few years from planting where the conditions have been favourable. Bush Apples of some varieties are grown on the Crab or free stock, and prove very satisfactory.

The more formally trained trees are exclusively adapted for gardens, and are especially suited for planting near walks and as divisional lines in kitchen-gardens. The larger of these are the espalier in the horizontal or vertical forms, the first—the horizontal espaliers—having the lateral branches trained at right angles to the central stem (fig. 849); the second—the vertical

espalier or "gridiron" trees—having the main branches taken to the right and left of the stem, from which vertical branches are trained up at intervals, all branches in both forms being in the same plane, so that they can be secured to trellises or walls. The principal other form adapted for the Apple is the cordon, which is a

balanced trees have a distinct appearance in a garden, but they require a good deal of attention in pruning and training to keep them in the right condition.

Whatever form of tree is required, endeavour to select such as are free from any indication of disease or deformity. Let them be trees that appear to have grown freely but naturally from the bud or graft; excessively vigorous or stunted trees are to be avoided, but the latter are the worst. See that the juncture of stock and scion is even and the union complete, as that is occasionally a source of material weakness. The characteristic habit of the variety must be remembered, and it is not always the most symmetrical tree that is the most fruitful, though symmetry is a point that must be considered.

Stocks and their effects.—The great majority of Apple-trees raised in nurseries are worked upon stocks of some kind. The principal important difference between stocks is in regard to their origin, namely whether they have been raised from seed or from layers. Plants differing widely in strength will be obtained in both methods, but generally the layers are more even, because only the best and most suitable branches are selected for the purpose. The chief point is that there is a material difference in the root systems of the two classes of stocks, which may occasionally be only asserted temporarily, while in other cases it will be found to be permanent. The vigorous vertical tap-root of a seedling Crab,



Fig. 849.—Espalier Apple-tree—horizontally trained.

still more restricted and artificial style of training. This is usually grown in the horizontal form, either with a single stem in one direction, or with two in opposite directions (double horizontal cordon). The trees can also be formed with stems inclined at an angle either as single, double, or triple oblique cordons, but these are not much in use in this country, the horizontal cordons being preferred as edges to walks, &c., where, under skilful treatment, very handsome exhibition fruits can be obtained.

The bush form admits of several variations of a more artificial character than the type; of these the most notable is the bowl-shaped, in which all the central stems and branches are removed, a series of even outer branches being trained outwards and then vertically, and treated after the manner of upright cordons. Fine fruits can be had in this form, and well-

Apple, or Pear gives rise in the early stage to the correspondingly strong upward growth of the stems and branches, hence the name "Free Stock" that is commonly applied to them. With layers of all the Paradise stocks, or those raised in a similar way, the root system differs in the fact that there is no direct downward extension of the main axis into the tap-root, but the first roots produced are fibrous, similar to those of a rooted cutting around that part of the branch covered with soil, and from the callus formed on the cut portion. In the case of the seedling Crab or Apple we have a natural unrestrained root system, and in the layered Paradise or dwarfing stock the root system is restricted. In consequence there is a broad distinction in their initial stages between trees budded or grafted upon the "free", and the "dwarfing" stocks, for stem and branch growth correspond

in degree to the root vigour and character. Experience with many varieties of fruits in differing soils and situations proves, however, that it is impossible to lay down a definite rule even with regard to the behaviour of any one variety under all circumstances on the respective stocks. Observation, too, will show that this is not surprising, for it is possible to have a seedling stock with abundant fibrous roots, and it is equally possible to have a layered stock with few fibres. We have seen many



Fig. 850.—Wild Crab Apple Stock.

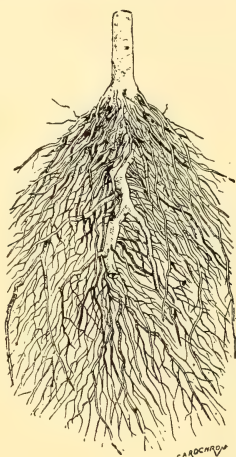


Fig. 851.—Paradise Stock.

that possessed all the characters considered to be peculiar to the others. Then again the root growth of the "free" stocks can be to some extent modified by shortening the tap-root, or bending it into a horizontal direction, while in some soils a strong rooting habit is induced in the Paradise and other layered stocks. In the true types of each the difference is clear, but they are rarely selected in that way, and the result is all the divergent experiences recorded by horticulturists regarding the adaptability of certain varieties to different stocks. Apart from this, some varieties of fruits possess an overpowering vitality, the effects of which in a few years are visible on both stocks and roots, completely extinguishing all special peculiarities of the former.

We may therefore take it in a general way that seedling stocks encourage free growth and postpone fruiting, but prolong tree life, while the layered stocks restrict growth, promote early fruit production, and possibly shorten the average life of the tree.

Many nurserymen now employ Paradise stocks of their own selection, and use layers from these almost exclusively. There are

several types of the broad-leaved Paradise thus employed, as well as the Nonesuch, all of which have originated from selected seedlings. The whole of these show greater strength than the French Paradise, the Doucin, and others of Continental origin, and are better adapted for the Apple as cultivated in Great Britain, ensuring fully developed and lasting trees. The French Paradise stocks are used for producing miniature trees, which flower very early.

The Crab stocks raised from seed of trees growing wild in the country usually present a marked difference from "free" stocks, which often are raised from the seeds of refuse Apples. The latter are most variable, and produce corresponding differences in the behaviour of the Apples worked upon them; the true Crab after the first few years makes moderate growth, and rarely produces fruit in less than eight to ten years.

The Age of Trees.—The age of trees at the time of planting has a bearing upon growth as well as upon fruit production. It is frequently asked: At what age is an Apple in the best state for planting in its permanent quarters? and various answers are given in accordance with equally varied experience. As regards growth only, it has been proved in some instances that a tree one year old from the bud or graft becomes better established and forms a proportionately more vigorous specimen in three or four years' time from the planting, than an older tree will do that has been subjected to several removals. The effect on fruit production is not so easily determined; but even in this respect there are many cases where the ultimate advantage has proved to be in favour of the younger trees. If one-year-old trees are planted they require extra care in the early pruning and training, there is also a longer time to wait before crops can be obtained; but against this we have to take the lower cost of the trees and their quick establishment. Well-developed two-year-old trees are very serviceable, and for garden purposes generally three-year-old properly-prepared trees are usually preferred, as fruit is secured early. These remarks apply specially to dwarf Apples on Paradise stocks; in the case of standards it is seldom advisable to purchase trees under three or four years old.

In all instances the due preparation in a nursery means that they should have been lifted and replanted to keep the roots within moderate limits. If a young tree has been left undisturbed for a long time, and it has become

strongly rooted in the soil, the transference to fresh quarters necessitates considerable root injury, and a corresponding check to the growth, which is not recovered from very readily.

Time to Plant.—The Apple can be planted at any time from the falling of the leaf until the buds start in spring. The success of the trees depends mainly upon their condition and the state of the soil at the time of planting. There are, however, several good reasons for the early autumn being preferred for this operation. In the first place the weather and soil conditions are usually more favourable for preparing the land and lifting and transferring the trees. Then, too, if trees are selected in a nursery, the earlier the choice is made the better chance there is of securing what are required. Above all, if trees are planted before the soil has lost the heat accumulated during summer and autumn, and before winter rains have saturated it, the injured roots have a better opportunity to heal. The tree also has time to recover from the check before growth commences in the spring.

But it is by no means essential that Apples should be planted in October or November. It might, for instance, be advisable to postpone the work on account of excessive wet, especially on heavy land. On light soil the rain might not interfere with the work, and in many cases it would prove beneficial.

Very early planting, *i.e.* before all the leaves have fallen, is not recommended; in moist districts and seasons it can be done without much risk, but there is always danger of the young growth shrivelling.

Trees planted late in the season are often injured by drought, and if the buds start before the roots are able to meet the demands upon them, failure will probably result. This may be partly avoided by close attention to watering and syringing. We have planted young Apple-trees in April, when the buds are expanding, without the loss of a single specimen, but the cost of the needful attention renders such planting an expensive proceeding. The particular season must always be taken into consideration, as there may be quite a month's difference in the starting of growth in the different years, and what may be safe in one season would be dangerously late in another. It is therefore impossible to fix definite dates for such work without the risk of their proving misleading to the inexperienced. The simplest rule is:

Plant Apples as soon after the leaf falls as the soil is in a suitable condition, avoiding frost at all times, and a wet state on heavy or adhesive soils.

Distances for Trees.—If a large plantation or orchard of Apples is to be formed, it will be needful to determine the arrangement and distances before the trees are secured. The principal methods of placing the trees are described in the chapter on Orchards, and it is only necessary here to give the most suitable distances for Apples.

Standards of the moderate-growing varieties may be planted 18 or 20 feet apart, but in orchards or mixed plantations where other fruit-trees are introduced between the trees as temporary crops, it is always advantageous to allow more space. There is a tendency to plant such trees too closely. A distance of 30 feet should be allowed whenever possible, and all strong-growing varieties must have this space at least, while even 35 or 40 feet may be allowed where growth is vigorous. The greater distances are advantageous for plantations in rich soil and moist districts, where, unless provision is made for a free circulation of air amongst the trees, they soon become loaded with lichens. Crowding is bad under any circumstances, but in such localities as those referred to, of which abundant examples will be found in some of the western counties, close planting in a few years produces its worst effects.

We have seen standard Apples planted 10 feet, 12 feet, and 15 feet apart with the intention of "thinning" the plantation as soon as necessary, but in too many instances the thinning is deferred until all the trees have suffered from crowding, and the removal of the extra trees is then attended with danger to those which remain, both as regards root disturbance and wind effects on the weakened permanent trees. This is a defect that is perhaps more frequently demonstrated in commercial or market plantations than in private gardens, as when the possibility of danger from "thinning" is recognized the trees are often left from year to year until a dense and useless thicket is formed. It is safer and preferable in every way to allow minimum distances of 20 feet or 30 feet, for medium and strong sorts respectively as standards, and fill the intermediate spaces either with dwarf trees or other kinds of fruit of bushy habit. Thinning will not then be such a serious matter, as the heads of the standards can develop freely.

Dwarf Apples on Paradise stocks, either as

bushes or pyramids, can be planted at 6 feet to 12 feet apart, but there are few varieties which will stand many years at the first distance, unless they are pigmy trees on some very dwarfing stock. In the list of select varieties at the end of this chapter we indicate separately some of the best small-growing varieties; these can be planted as stated.

Examples of useful small-growing sorts are Seaton House, Stirling Castle (fig. 848), and Margil, which under ordinary circumstances can be grown for ten years at 6 feet apart, and sometimes even permanently.

For the majority of dwarf Apples 10 feet is the most suitable distance, and this allows space for the free development of the trees, and permits intermediate cropping or cultivation. Bush Apples on the free stocks (either seedling Apple or Crab) should be at least 12 feet apart, and in the best soils 15 feet is not too much for the strongest varieties.

Espaliers on trellises or walls require 20 feet distance to permit full development, and fan-trained trees (though they are seldom grown now) need similar distances. Single horizontal cordons should be 10 feet apart, and double horizontal cordons 20 feet, thus allowing an extension of 10 feet in each direction. If single oblique or vertical cordons are grown they can be planted at 2 feet apart, and are then useful for filling up the intermediate spaces on a trellis or wall while espaliers are attaining their full size.

Marking the Stations.—When the plan and distances have been decided upon, the next point is setting out the places for the trees, and though this is a matter that does not present any great difficulties several details require attention. A well-designed and carefully-laid-out orchard or plantation has a very pleasing appearance, and it is worth a little extra trouble at the beginning to ensure this. If a good base-line is secured to start with, it is not a difficult task to set off a plantation of fruit-trees with rod or tape, line, and pegs, in any shape and at any required distances. The chief points to be observed are to have the first line straight, to be accurate in measuring off the distances, and to set the pegs each time in the same position on the tape or rod marks. Mistakes are often made by the inexperienced in this work, by sometimes setting the pegs inside and at others outside the mark, and in a large plantation this soon leads to considerable irregularity that will take a good deal of time to correct when the trees are set out. If pegs

of equal diameter are used, and approximately equal to the diameter of the stems, the measurement may be conveniently made from the inside of one stake to the inside of the next in the same line. But in this case allowance must be made for the diameter of the pegs in the total length of the row. For example, if fifty trees are to be set out in one line at 10 feet apart, the total length required, if the stakes or pegs are 2 inches in diameter, will be 508 feet 4 inches, not 500 feet. If the stations are set off exactly at 10 feet, the measurement must either be made from centre to centre of the pegs, or from the inside edge of one to the outside edge of the next, or *vice versa*. There is more risk of mistakes in taking the centres of the stakes than in measuring to the edge, provided they are all equal in size. These appear simple matters to dwell upon in detail, but we have seen troublesome errors arise from ignoring them, which are necessarily more marked in the largest plantations.

If the pegs are only used for the purpose of marking off the plantation, and are to be removed as planting proceeds, it is a material help if a tree is first planted at the end of the line, and one in the centre, as they can then be sighted from either end of the row, and afford a guide for keeping the others in line.

Stakes.—If staking is an essential procedure to ensure the safety of the trees, as it is in many situations, there are several advantages in using the stakes for marking out the ground and at once putting them in position for the trees. Under the best circumstances staking can only be regarded as a necessary evil, and whenever such support can be dispensed with it is desirable to do so. But it is only in very sheltered situations, or where one- or two-year-old trees are selected, that stakes are not needed. They are especially requisite for standards; but even dwarf trees, if well developed, require securing in some way. The operation should be simplified as much as possible if the object is only to protect the trees from damage by wind until they are well rooted. Where trees are planted in grass-land used for grazing, more elaborate precautions will be required. These are referred to under the head of protection. In light, loose soils staking is particularly important, and it is necessary to have the stakes of sufficient length to allow them to be driven deeper into the soil than in heavier land. For standard Apples they should be from 5 to 7 feet long, proportionate to the length of the stems, allowing from $1\frac{1}{2}$ to 2 feet of the stake

in the soil; for dwarf trees a length of $2\frac{1}{2}$ to 3 feet is usually sufficient, and a foot length in the ground is generally enough to keep the trees steady.

Stakes with rough surfaces or edges are objectionable, as there is more danger of stem abrasion, and those with the bark attached, especially if somewhat loose, provide retreats for insect pests. The stakes should preferably



Fig. 852.—Method of Planting and Staking.

be round, as the edges of square ones are sometimes a source of trouble; and they must be of sufficient diameter to give the requisite rigidity, not less than $2\frac{1}{2}$ inches. The base should be evenly pointed, as they can then be driven into the ground with more regularity; if cut wedge-shaped they are easily thrown out of their places by stones or hard clogs of earth when being forced into the soil. When sufficient time can be allowed for the stakes to dry before they are wanted for use, they should be well tarred; and sound stakes so prepared will last for years, probably, indeed, until the trees are independent of their aid.

The preceding remarks refer to cases where a single stake is employed for each tree, which

is planted up to the support, and therefore is exposed to some risk of bark injury unless due precautions are adopted to avoid this by suitable tying, or by pads between the tree and the stake. It is sometimes found more advantageous to have two or three stakes to each tree (fig. 852), which cannot then be placed close to the stem, and they cannot be readily utilized for marking out the exact stations, but the method is convenient where extra protection is needed.

Size of Holes.—If the whole of the ground has to be cultivated as directed earlier in this chapter, it will not be advisable to make the holes for the trees until planting can be proceeded with. In grass-land the stations must all be prepared in advance, removing the turf from a space 4 to 6 feet in diameter (preferably the latter), and either cutting up the turf for incorporation with the soil in digging, or, if that is not desirable, taking it away altogether. In the lighter or poor soils the addition of the broken-up turf is beneficial, but in those of a heavier and more fertile character it is not necessary.

Treatment of Trees on Arrival.—The majority of nurserymen now give special attention to the careful packing of fruit-trees for sending by road or rail, in fact, the packing of plants constitutes a most important department in a nursery. The result is that Apple-trees can be sent some hundreds of miles absolutely secure from external injury. As, however, railway journeys are occasionally unduly prolonged, risk is incurred in the drying of the roots and stems. More failures arise from this cause than from any other in connection with the removal of Apples, yet it is frequently overlooked, and disasters are attributed to everything but the right cause. The most serious results in this direction are seen in very early autumn or late spring planting, but it has been found that evaporation from the bark of Apple-trees is considerable even in the winter when the air is dry. As regards the smaller twigs, the moisture evaporated has been found to exceed 10 per cent of their total weight in a few hours. It is not desirable to expose either roots or trees to severe frosts, but with ordinary care the roots of Apple-trees are uninjured by frost, whereas we have seen many either seriously checked or killed by undue drying in transit.

If the trees arrive at a time when the weather or soil is unfavourable for planting immediately, they should be unpacked and carefully laid in by the roots in trenches in a sheltered position. When the soil is frozen too hard for this pro-

ceeding, if cool sheds are available the trees should be placed in them, and the roots covered with damp mats or soil. For late spring planting in dry weather it is advisable to dip the roots of the trees in water as soon as they are received, and if they appear to have been much dried this can be repeated before planting.

Planting.—In the operation of planting Apple-trees one of the most important conditions is the state of the soil at the time, and particularly on heavy land. If the holes are made in adhesive soil when wet, the sides will often dry into a brick-like consistency almost impervious to roots and water. Thus moisture is excluded in dry weather, and in wet times it cannot pass away freely, as the base of the hole will probably be in a similar puddled state. Trees planted in this way often show the ill effects for years.

The soil must in all cases be broken down into a moderately fine state, and the more numerous the roots of the trees to be planted, the more important this is. In rough soil carelessly filled in a large proportion of the roots are for a time inoperative, and some are permanently injured. It is impossible to plant trees satisfactorily where the soil is in coarse clod-like lumps.

The size of the hole must be proportionate to the extent of the roots, but it is well to allow at least 6 inches more than the spread of the roots, as they can be regulated more thoroughly. The depth also will depend upon the roots, as Apples on Crab or free stocks, which produce strong downward roots, must have a greater depth than those of the surface-rooting Paradise stocks. In the former case the advice usually given, to "spread the roots", is often quite impracticable, as with three- or four-year-old trees these are as strong and inflexible as the main branches, and all that can be done is to carefully fill in the soil amongst them. Such trees may need holes 1 to 1½ feet deep, while the more horizontal-rooted dwarfing stocks may require only 9 to 12 inches.

These directions will need modification by the nature of the soil and the moisture present. For instance, it is not only safe to plant deeper in light soils than in heavy ones, but it is sometimes a preferable course if there is no danger of getting into an unsuitable subsoil, as the roots are less likely to suffer from drought than when near the surface. In very dry soils and climates deep rooting should be encouraged for this reason, whereas in heavy soils shallow planting is advantageous. The often repeated

direction to plant Apples or other trees at the same depth as they have been in the nursery is usually a safe course to follow.

Planting on the surface and mounding up the roots is advocated and practised in wet situations and in extremely heavy soils, but Apples should only be planted under such conditions in very exceptional circumstances. It would be unwise to attempt to form a commercial plantation in that way. A thorough system of tile-draining would be a preferable proceeding, or, if the situation is too low for this, superficial draining may be attempted by means of shallow trenches running across the ground.

The Apple-trees intended for planting should be carefully examined, and all damaged roots cut clean at the points with a sharp knife, either straight across, or with a slight slope on the upper side, the former being better for all downward roots, and the latter for the horizontal roots. If any branches start too low down the stem they can also be more readily removed before the tree is planted.

If the stakes are in position and the holes prepared as directed, it is only necessary to place the trees to the stakes at the required depth, spread out the roots as evenly as possible in all directions, and fill in the soil. The latter part of the operation should be done gradually and with care; some workmen throw large spadefuls of soil on, or roll it in from the sides, as if the only object was to conceal the roots as quickly as possible. The work is never done satisfactorily in this way. Small quantities of the finer soil should be placed over the roots first and worked in among them with a stick if necessary; after this the remainder can be completed with more speed. Where stout roots start from near the base of the stem in a downward direction it often leaves a hollow that should be provided for by making a slight mound for the base of the tree to rest upon, otherwise it is often difficult to fill in properly afterwards. With the exception already referred to, the roots should be arranged as near the surface as seems safe, and with a slight upward rather than a downward bearing at the points. It is advisable to go over the plantation several times in the season after planting for the purpose of treading the soil firmly about the roots. In light soil, if the weather be very dry at the time of planting, a thorough watering will help to settle the soil. On heavy soils treading over the roots requires more care, or, if wet, it will be forced into a solid mass that can never be restored to its former condition

without moving the trees. When the soil is fairly dry, light treading only is needed to render the trees sufficiently firm, and it is better to let the process be effected gradually by the sinking of the soil than to tread it hard.

Treatment after Planting.—The first consideration after planting a well-developed Apple-tree, either a standard or dwarf, is whether the branches shall be cut back immediately or left for a season. Opinions and practice differ on this question, and varied experience as to the merits of each method has no doubt resulted from the different circumstances under which each may have been carried out. Cutting back at once after planting is supported by the view that in reducing the branches the balance between those and the roots which have suffered in the removal is maintained. There is, therefore, less demand upon the latter until they have had time to become established and can perform their proper functions, than if the branches are allowed to remain their full length and produce a larger number of leaves. Another point in favour of this plan is that the lower buds on the branches are later in starting to grow, and this gives the tree a better chance to recover before the foliage is fully expanded. Those who advocate postponing the cutting back for a season do so on the ground that the greater number of leaves produced by the unpruned branches assist the formation of roots, and this helps to restore the tree more quickly. In moist, cloudy springs this is probably true, but in hot, dry weather the benefit derivable from the leaves is reduced by the great evaporation which takes place from them, and the ill effects are visible both in the dying back of the young shoots and in the shrivelling of the wood unless the roots have become well established. In a general way, therefore, we have found it safer to cut back at once, better formed and more compact trees being usually the result.

For further directions for transplanting see chapter xx.

GENERAL PRUNING AND TRAINING.

In the following directions the procedure necessary to secure well-balanced trees is detailed for each form of training, and the treatment is traced in most cases from the maiden stage, though it is more usual and convenient in gardens to purchase trees which have passed through the first degrees of training in the nurseries.

Standards.—It is highly important that these should be reared with clean straight stems; that the stem should be self-supporting; that the head should be commenced at the proper height; and that it should be formed with regularity. The mode formerly adopted to obtain clean stems rendered continuous staking essential; and a tree for which staking is absolutely necessary in its youth will always be liable to lean and twist after it has attained a considerable size. When the maiden tree had been well transplanted, and was in a vigorous state, it was not an unusual practice to keep the stems well trimmed, that is to say, every shoot that appeared upon them was cut closely in till the desired height was attained. A few shoots at the top were only to be seen, and a slender stem unable to keep itself upright was the consequence. This is an artificial stem, for the Apple does not grow in a natural state to the height of 6 or 7 feet without side branches, which bear leaves to thicken and strengthen the lower part of the stem. When the tree with the artificially-formed stem is transplanted, it has, however, this advantage, that though liable to bend from feebleness, it can be easily lashed straight to a stake, and so far some good comes out of evil; but on the other hand the stem will require support for years. Rather than have crooked trees, it is better to make sure of straight ones by supplying a fresh set of stakes, and by the time these become decayed, the trees, on their removal, will exhibit straight and apparently self-supporting stems; but left to their own strength to support their tops, now large enough to be acted upon with considerable effect by the wind, the stems bend, and cannot then be well straightened.

To rear a straight substantial stem incurs little additional trouble in the first instance—much after expense is saved—and at the same time a satisfactory result is ensured. It has been explained in the chapter on Pruning that roots and wood are produced in proportion to the amount of foliage. In rearing a properly-constituted stem we must bear in mind that important fact. We cannot by any means get so much work done by a few leaves at the top of a stem as we can by ten times the number produced partly at the top and partly along the sides. We want thickness of stem, for if we have that, the desired height will be attained in one or two seasons; but if the stem is tall and disproportionately slender, it is very difficult to render it inflexible. A slender stem, 6 or 7

feet high, and which has no leaves to thicken it except those above that height, will increase equally along its whole length. To be self-supporting it should be thickest at the base, as would have been the case had it not been for the injudicious use of the knife.

A well-grown stem should have the following dimensions—Height, 6 feet; diameter at base, 3 inches; in the middle, $2\frac{1}{2}$ inches; and at 6 feet

high, where the top begins to branch, 2 inches; this will be self-supporting. A stem that has once assumed a tapering form will retain that form as long as it exists. The whole tree may be torn up by a hurricane, but the stem will not become crooked, and this is precisely the kind of stem that is wanted. We shall therefore endeavour to show how it may be obtained.

Commencing with the maiden shoot from the

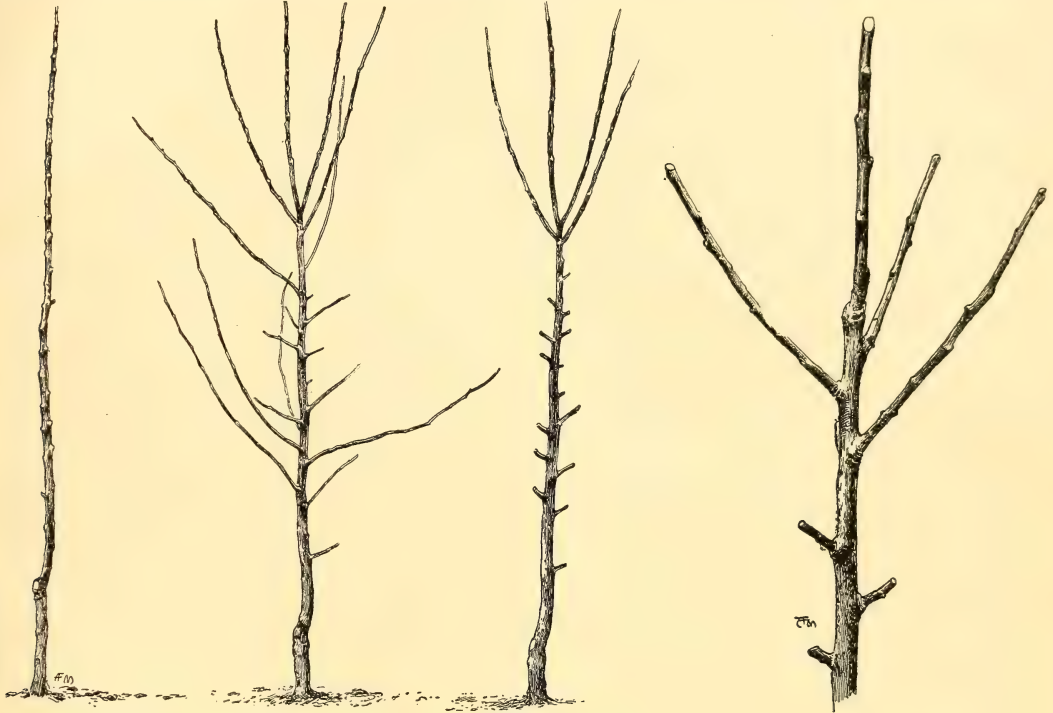


Fig. 853.—Maiden tree (one year from bud). Can be cut down to form a dwarf or espalier, or remain the full length for a standard.

Fig. 854.
A two-year-old standard, unpruned.

Fig. 855.—The same tree with lateral growths shortened and head prepared for the first pruning.

Fig. 856.—Head of the same tree enlarged to show pruning for the leading shoot and the three main branches.

graft or bud, we find it during summer furnished with leaves from near its base to its extremity. If at the end of the growing season we girth the shoot at the top and successively below each leaf downwards, we shall find that every girth is greater and greater as we descend. The difference between each measurement will be greater or less according to the health, nature, and size of the leaves. Where a portion of a shoot is deprived of leaves such gradation does not take place, but if there are leaves below the naked portion, there will be a sensible difference in the increase of girth below the first of them, and so on to the base. From what has been stated it is evident that all the leaves on the first shoot from the graft or bud should be encouraged. When the leaves fall in autumn, buds more or less prominent will be seen along

the stem, and perhaps some may have grown into laterals; the latter should be shortened at the autumn or winter pruning to two buds.

In the second season the terminal bud will start into vigorous growth if no accident has happened to it, as will also several others along the shoot, and some will remain dormant, especially those near the base. The shoots that do start should be allowed to grow, taking care, however, to check any that are likely to compete with the leader. Foliage should be encouraged on the latter, and likewise on the young shoots of the previous year. With regard to the laterals on the former year's shoots, they may be allowed to grow till the end of July, and their extremities should then be pinched or cut off. The reason for allowing them to grow is in order that they may bear

foliage to give additional strength to the stem below them. The foliage of these laterals also encourages the formation of roots.

In autumn, when the growth of the second season is completed, the tree will exhibit a stem consisting of the first summer's shoot, now two years old, and, in continuation, the young shoot or leader which has just ceased growing. The laterals stopped in July should now be shortened to one or two buds, with the exception of two or three of the lowest, which should be cut close to the stem. The same mode of proceeding with regard to the side shoots on the stem should be adopted every year. As the head of the tree is in course of formation, and is producing abundance of foliage, the side shoots can be gradually dispensed with. The quantity of foliage on a young tree should considerably exceed every year that of the previous one; therefore in gradually removing side shoots, care should be taken that the consequent diminution of foliage should bear only a small proportion to the increase made by the new branches and shoots at the top. The rate of increase of these must regulate the more or less gradual removal and final clearance of the side shoots.

If the tree has been planted in rich soil, and has consequently grown vigorously, the upright leader will have attained the height of more than 6 feet. But whatever may be the intended height of the clear stem, the leading shoot ought to be cut three buds above that height, which would be a few inches above 6 feet from the ground for a stem 6 feet high. Supposing, however, that the extremity of the shoot reached very little above the intended height of stem, the buds immediately below the cut, and which are to commence the main limbs of the tree, would be situated on the softest part of the shoot. Instead of this it would be desirable that these limbs should originate from buds on the more substantial part of the shoot; therefore, if it happen that the shoot is not firm at the required height, it will be advisable to let it grow for another season, and then cut it back.

In the following spring three shoots should be encouraged from the three buds just below the place where the leader was cut. Three main branches are better than two, as regards the formation of a well-balanced head; four are too many from the same point, or so nearly from the same point that when they become large they appear to have so originated.

As the shoots grow they should receive par-

ticular attention throughout the summer, for much depends on the limbs being fairly and equally started. If left to themselves, they will rarely proceed at an equal rate of growth. The uppermost will incline to take the lead, and will endeavour to grow upright to form a stem. This tendency must, however, be checked in good time. The shoot having this inclination should be made to diverge at a lower angle than either of the others; and, on the other hand, the weakest shoot ought to be elevated the most. In short, equality of growth between these primary shoots must be maintained.

Before the growing season is over, 1 foot at least of the lower part of each shoot ought to be made straight, and all three should be trained equidistant, and to diverge from the stem at an angle of about 45°. At the autumn or winter pruning each of the shoots should be cut back to within 9 inches or 1 foot of its base, observing to cut above two buds as nearly opposite to each other as possible, and pointing in the direction which it is desirable the shoots springing from them should take.

In the following season two shoots, and no more, should be encouraged from each of the three original ones. The head will then consist of six shoots, originating six principal branches. By a little attention in summer, these can easily be kept at equal distances from each other, and also from the centre. The tree, it is presumed, being vigorous, many shoots will grow from the branches formed as above directed. If these were allowed to remain till autumn, and then cut back, many more would again start in the following spring; or if they were cut off closely, the branches would be too naked. It will therefore be advisable to pinch them in summer, when they have grown 6 inches, commencing with the strongest. By this process shoots that would otherwise cause confusion can be made to assume the character of fruit-spurs, from which some of the largest and fairest fruit will be obtained. This is also the way to turn to account any strong shoot, or rather any one that would evidently become such, and which, if allowed to proceed, would occupy a position where it was not wanted.

It is better to attend to this in summer than to allow the shoot to grow till autumn and then cut it back; and this again is better than permitting it to remain for some years and form a thick branch which must then be cut out. In short, the head being fairly started with its six equidistant branches, it may be left to itself, with the exception of pinching, as

above recommended, any badly-placed shoot, and checking any of the leaders that are likely to become too strong.

Dwarf Pyramids and Bushes.—In order to have a well-formed pyramid tree, it is best to begin with a maiden and merely top it. Allow it to establish itself for a year, then cut it down to about 1 foot from the ground. Train upright a shoot from the uppermost bud, and outwards the shoots that may push below. After the

leaves have fallen, shorten the upright leading shoots to 15 inches above where it was cut in the preceding year. Proceed thus every year till the tree attains the desired height. This may be from 6 feet to 12 feet, according to the distance from other plants or trees that would be injured by shade.

In the formation of a dwarf bush Apple-tree, the points to be borne in mind are practically the same as in the preceding, but a more open character is aimed at, and the main central stem is not so essential as it is to the pyramidal form. The branches should be disposed as evenly as possible, and induced to grow outwards by pruning to a bud pointing to the circumference of the tree's branches. Some varieties on the dwarfing stocks require very little pruning after the first year or two, as they make but moderate



Fig. 887.—Three-year-old dwarf Apple, before pruning.



Fig. 888.—The same tree, after pruning either for a pyramid or a bush.

growth, indeed it is occasionally difficult to keep such trees sufficiently furnished with fresh shoots.

Some varieties may be both pruned and trained in summer by removing the young shoots where they are crowding each other, for if sun and air are not freely admitted to the centre of the trees, fruit-buds will be formed sparingly or not at all. The shoots allowed to remain should be shortened, 6 inches of the young wood to remain afterwards. When the trees have grown to the required size, and are in full bearing, the young wood should be closely cut in. The last thinning of the shoots, and final stopping, should take place about the end of August. The fruit-buds will form, and both the young wood and fruit will have a

chance to ripen satisfactorily. If the pruning is well managed, any other training is seldom necessary.

Dwarf bowl-shaped Trees.—If the tree has made one season's growth from the graft or bud, it may be planted in autumn; the extremities of the shoots must be shortened a little, and it should be allowed to grow at full freedom till next autumn, when it must be cut down to within 9 inches of the ground. The tree, having been a year established, will now be able to produce vigorous shoots, three of which should be selected, as in forming the head of a standard. During the summer, care should be taken that the three shoots make equal growths. They must be cut back at the winter pruning to between 6 and 9 inches in length, and thus, as

in the case of standards, six branches will be | branches. When this is done, each branch ought



Fig. 859.—A well-developed six-year-old pyramid Apple, after pruning.

originated. These should be allowed to grow freely during the summer, so as to be tolerably straight, and if kept equidistant so much the better.

It would be advisable to regulate these six shoots in winter by training them to a hoop, which ought to be 6 feet in circumference, and the branches, secured at equal distances, would then be just 1 foot apart. In many cases materials for hoops might not be at hand, and the purchase of them might be found too expensive. If so, three straight or nearly straight sticks, about 2 feet long, may be substituted. Three such lengths can be much more easily procured than a hoop 6 feet round. At $\frac{1}{2}$ inch from each end of the 2-foot sticks cut a notch, so that a piece of bass, tied round, may not slip. Place the stick across the centre of the tree, and secure the two opposite shoots by the ties, near the end of the stick. Stretch the sticks in a similar manner between the other two pairs of opposite

to be exactly 1 foot from those next to it; if any are wider apart than that distance, let them be brought to it. Whether a hoop or this contrivance be employed, the shoots, after being secured, should be shortened to a few inches above the hoop or place where they are 1 foot apart, in order that each of the six branches may be there subdivided into two, making twelve in all. In shortening, where the leading branch is not intended to be subdivided, observe to cut above a bud pointing away from the centre, or in the direction that the shoot forming a prolongation of the branch is desired to take. From the inclination of the branches, and favoured by the open space which they form, strong shoots from the upper sides of the inclined branches will be apt to start in the middle



Fig. 860.—A well-developed six-year-old bush Apple, after pruning.

of the tree, where their presence would prove injurious. The means already pointed out for

converting what would otherwise prove worse than useless shoots into fruit-spurs, should therefore be employed.

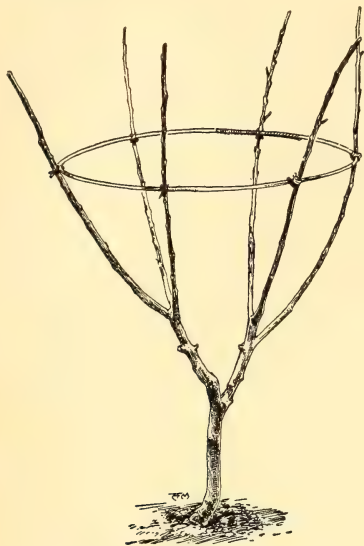


Fig. 861.—Three-year-old Apple with branches tied to ring to form a bowl-shaped or open bush.

Cordons.—This system of training is adapted both for large and small gardens. The usual forms are the simple lateral (fig. 862) and the

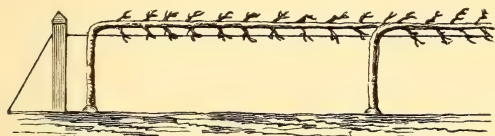


Fig. 862.—Lateral Cordon.

bi-lateral (fig. 863). The lateral consists of a single shoot bent in a horizontal position, and trained along a single wire fixed about a foot



Fig. 863.—Bi-lateral Cordon.

from the surface of the ground. This wire is fixed at one end to a stout iron support, which is best kept in position by being soldered into a solid block of stone. This is rather expensive at first, but when its durability is taken into consideration, it is as cheap and far more satisfactory than posts made of oak or other wood, which in some soils soon decay. One of these permanent iron supports may be placed at each end of a very long border, and to keep the wire steady, iron supports should be placed at every 10 or 12 feet; these should have a

hole drilled near the top, and the wire be run through these holes before it is permanently fixed.

For tightening the wires the useful little appliance termed the *raidisseur*, which has been in use for many years in French gardens, and is now manufactured in England at a cheap rate, is the best, as however tightly the wire may be strained at first, in the course of a year or two it will hang loosely, then by simply turning the key of the *raidisseur* it can be made firm at once. This little implement may be fixed on any part of the wire between the two end-posts.

For training as cordons, plants one year from the graft may be selected, or if required to come into immediate bearing, trained trees can be obtained. Beginning, then, with maiden plants, we plant one in a sloping position, at every 6 feet along the wire, and all that is required is to bend down the shoot and fasten it to the wire; being placed in such a position, buds will start growing regularly along its whole length, and the wire thus be furnished in two or three years. Sometimes each tree is inarched on the one next it, as represented in fig. 862, so that the whole of the branches form a continuous line. This is frequently practised on the Continent. Persistent summer pinching will soon throw the trees into bearing if the same stocks are used as are recommended for bushes. Double or bi-lateral cordons are formed by heading down the young trees to within ten inches of the ground, and two shoots of equal strength are trained in opposite directions along the wire. The general management is the same as recommended for lateral cordons.

In cold and unfavourable districts the finer sorts of Apples may be grown as upright cordons, and trained to walls. The leading shoot requires to be stopped twice during the growing season, in order that the spurs may form regularly. Trees of this description are sometimes planted between the usual fan-trained wall-trees, marking the division between them. and from such trees very fine fruit may be obtained.

The best position for horizontal cordons is by the side of walks in the kitchen-garden. No doubt many other positions would suggest themselves to the intelligent cultivator, such as the front of a warm border for choice varieties. By this method of culture fruit of the highest quality is obtained, and at the same time an interesting feature is added to the garden.

Espaliers (fig. 865).—This mode of training is well adapted for the Apple either in large or small gardens. The trees are easily managed; annual disappointment is the result. It may be well, therefore, to point out the cause of this. We will suppose that the horizontal branches



Fig. 864.—Table Cordons.

have been trained at proper distances, and that the intended number of them has been obtained. A number of shoots will grow in an upright direction from the upper sides of each horizontal, but more especially from the topmost ones. Each of the shoots on these will, from their position, command more sap than the shoots which constitute the leaders of the horizontals. Let us take one of them: if we allow it to grow during the season, and then cut it off, it is so much of the vigour of the tree wasted; and the fruit can be well exposed to both sun and air, whilst it is more secure from being blown down by wind than when it is grown either on standards or dwarfs. These advantages ought if it is cut to within a few inches of its base at the autumn or winter pruning, two or more equally strong shoots will start in the ensuing season; and if each of these is treated at



Fig. 865.—Espalier Apple-tree at Madresfield Court.

to more than counterbalance the only drawback, namely, the expense of the espalier rail. Many espalier trees may be seen that produce scarcely anything but wood; and, of course, the next pruning like the original, a mass of shoots will result, so that that which was in the beginning but a single bud, will soon become a sort of burr, yielding crops of shoots

like a Willow-stool. The sap flows in greatest abundance into the upper branches to be again fruitlessly expended, instead of being equally distributed throughout the whole of the tree, and unproductiveness is the consequence. The cause having been traced to the buds on the upper branches, and more especially the buds on the higher sides of these branches being

allowed to develop strong shoots, it is evident that the remedy consists in checking that tendency, and this is in fact the principal object to be kept in view in managing espaliers; for, however well they may be attended to in other respects, they will not afford a satisfactory result if that be neglected.

First Season.—This may date from the planting of the tree in autumn; it should then be cut down to 1 foot above the ground. Train

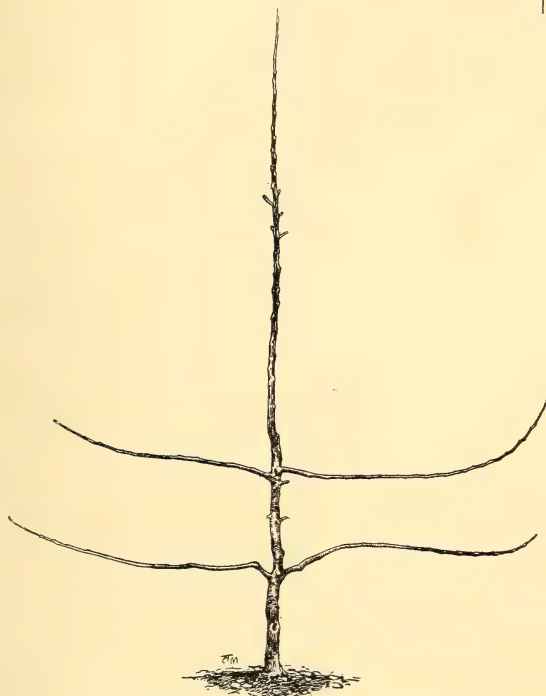


Fig. 866.—Two-year-old espalier Apple, before pruning.



Fig. 867.—The same enlarged to show pruning to produce a third pair of horizontal branches and a continuation of the growth in the others.

the shoot from the uppermost bud upright in summer; also a shoot to the right and another to the left, at an angle of 45° in the first instance, and if one grow stronger than the other, depress the strong and elevate the weak.

Second Season.—Cut back the upright shoot to about 1 foot from where it was formerly shortened, or to one bud above two buds eligible for forming a second pair of horizontals. These two buds should be a little below the horizontal line along which the shoots from them are ultimately to be trained. Let the lowest two be brought to the horizontal position if strong, but only nearly to that position if weak. These lowest branches cannot be too strong; therefore, the shoots they produce should be allowed to grow unchecked, except so much as may be found necessary to prevent their competing too much with the leaders.

Third Season.—Cut back the upright shoot as before, and shorten the laterals on the horizon-

als to about 2 inches. Shoots will start from the parts left, and they should be pinched when about 6 inches in length.

Proceed in this manner till the requisite number of horizontals is obtained. When the upright shoot is cut in order to obtain the two uppermost horizontals, only two buds should be allowed to grow, a third one, for an upright, being no longer required.

The direction of the branches being that of horizontal lines at equal distances, the leaders have only to be trained in that direction, and the intended form of the tree will be ensured. This part of the management is so simple that it requires no comment. It is, however, necessary to direct particular attention to the way in which the flow of sap should be equalized, and consequently an equal degree of vigour maintained amongst the respective branches, and according as that equality is maintained, the more healthy and productive they will be;

moreover, the fruit will be of better flavour than when some of the branches are starved whilst others are over-luxuriant.

When the shoots begin to grow in the early part of the season, inspect the tree, and take especial notice of the strongest branches, and also of the weakest. If any of the younger branches are thicker and more vigorous than those that are older, such ought not to have been the case, and equality must if possible be restored. The shoots on the strong branches must be kept well pinched in, commencing early; as soon as they have extended to five or six leaves, they should be pinched immediately below the fifth one. The shoots on the weak branches, on the contrary, ought not to be pinched till they have attained a considerable length, and then they should be left long enough to bear a greater amount of foliage than those which are over-vigorous. By these means the weak branches will gain upon the strong. When that equality is regained, which indeed ought never to have been lost, it will still be necessary to commence summer-pruning the upper branches first. Presuming that in the spring all the branches possessed an equal degree of vigour, and if, when the shoots started, they were all stopped or pruned equally and at the same time, the upper ones would gain an advantage over the lower, from the natural disposition of the sap to flow into the former in preference to the latter. Hence the necessity of always checking the young shoots in the upper parts of the tree before those in the lower.

Wall-trees.—Although the Apple is grown in perfection in the southern parts of the kingdom as standards, dwarfs, and espaliers, yet certain sorts are very generally provided with a wall in northern situations. Apple-trees do not require the minute care that some other kinds of wall-trees do; yet, as walls are expensive, every kind of tree planted against them ought to be well managed and productive.

The first consideration is the mode of training which should be adopted. If the wall is low, the horizontal espalier is decidedly the best, and it is also suitable for those of the usual height. In some particular cases, as against the high gable end of a house, the tree may be trained in the fan manner, in order that the wall may be the sooner covered. If the horizontal mode is the one adopted, the next consideration is the distance between the horizontal branches. For the weaker-growing varieties of dessert Apples, the distance may be three

courses of bricks, or 9 inches; but for vigorous, large-leaved sorts, 12 inches, or four courses of bricks, will be preferable. In cold situations this width is not too much; for if part of the surface is not covered with foliage, the sun's rays, acting directly against the naked bricks, will heat the wall to a much higher degree than if the surface were entirely covered with foliage. Whether the distance between the branches be 9 or 12 inches, the lowest should be 1 foot from the ground. But the upright leading shoot ought to be cut back, so that the two buds intended to originate the lowest pair of horizontals may be about 9 inches above the surface, thus allowing them 3 inches of an ascent to the line by which they are afterwards to be trained. The next pair of horizontals may be allowed nearly as much; the third course of horizontals somewhat less than the preceding; and so on to near the top, where the branches may proceed at right angles from the stem. In some cases two courses of horizontals may be taken in the same season, cutting back the upright shoot to one bud above the place from which the side shoots are required to push. This should not be done later than June.

The directions for maintaining equality of vigour among the branches of espalier-trained trees apply also to those trained on walls. The summer pruning, and the pruning of the spurs in winter, are conducted in the same manner as with the Pear, in the chapter on which further particulars will be found.

Root-pruning.—This means of checking the excessive vigour of the Apple is described at some length in the chapter on the Pear, it is only needful to point out here that it is often efficacious in checking undue growth and promoting fruitfulness in both cases. In fact, in the case of large established trees it is the only method available, as though lifting the trees can be adopted when they are young, it is a very expensive process when they are more fully developed, and could not be followed out on a large scale.

Sterility may result from other causes than excessive growth, and apart from the introduction of varieties to assist in pollination, a remedy may sometimes be found in increasing or changing the manurial supplies. The subject of manures is so fully dealt with in the chapter on that subject that it is unnecessary to enter upon it here except to call attention to one or two facts. A healthy young Apple-tree in a substantial and suitable soil is practically independent of manurial aid in its early stages. When



STANDARD APPLES, 8 years old, in grass, Royal Gardens, Windsor



BUSH APPLES in Royal Gardens, Windsor

the fruiting stage is reached the exhaustion is greater, and the cultivator must then watch closely the behaviour of the tree, and if there are indications that the strain is too great, prompt resort to suitable manures will often restore them to their right condition. In the same way, if the trees be weakly in their early stages, the application of manure will bring them into a better state, provided they are not diseased and there is no serious defect in the soil.

Gathering and Storing the Crop.—The period for gathering any particular sort of Apple cannot be precisely stated, for it varies in different

Dry weather is to be preferred; but if the season is wet, the fruit must sometimes be gathered when damp, in which case they should be spread thinly in an airy place to dry.

In gathering, great care should be taken not to bruise the fruit. The gathering-baskets or trays ought to be lined with some soft substance, and too many fruits should not be placed above each other. Indeed, choice sorts, and such as are intended to be kept through the winter and spring, should be laid singly on a light hand-barrow, the bottom of which is of large area and lined with a mat or cloth; over this first layer another mat or cloth should be

spread, and then a second layer may be placed in the barrow. The fruit should be taken out by hand and not tumbled out of the baskets.

The late-keeping sorts should be stored in a place where the exhalations from ripe and nearly ripe fruit cannot reach them. The latter could be kept in baskets lined with some well-dried straw, and placed above each other. If the quantity of Apples fit for use be too large for the space that can be allotted for them in the fruit-room, they may be laid on the floor of a loft or other place where there is a free circulation of air, which, though necessary, cannot however be admitted at all times without occasion-

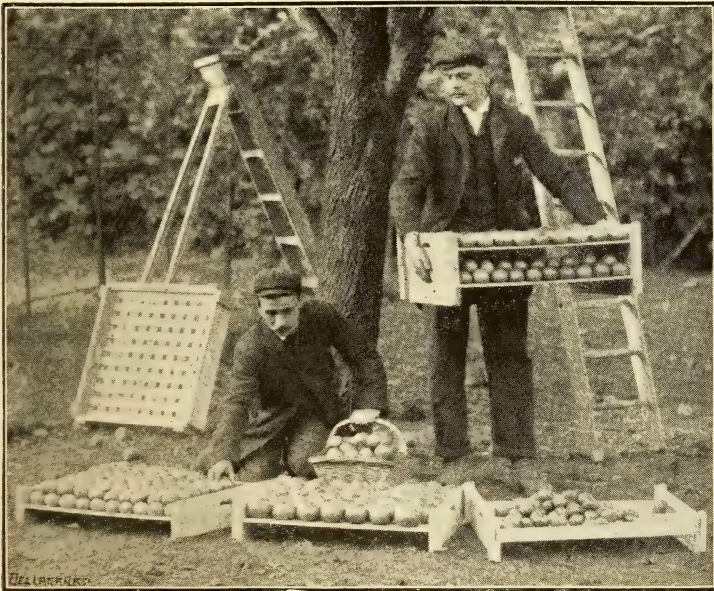


Fig. 863.—Orr's storing trays for Apples, &c.

localities according to the soil and climate, and even in the same locality in different seasons. In light dry soils the fruit will not hang so long as in those that are of a stronger nature. The falling of unsound fruit is no criterion; but when that which is sound begins to fall, the crop may be gathered. Or, the fruit may be tried without pulling, and if the stalk then parts easily from its connection with the spur, it is fit to gather; but if it hold firmly at that place, so that in order to separate the fruit it must be twisted and broken, the fruit has not attained full maturity. When ripe, the seeds are of a brownish or nearly black colour. Some early sorts of Apples ripen in succession, and should be gathered accordingly; such, indeed, require particular attention in respect to gathering; for if taken a few days too soon they are watery, if a few days too late they are mealy.

ing vicissitudes of temperature. If the air is cold for several days and nights, the fruit will also become cold; and if the air should get suddenly warm, the fruit will get wet from condensation. In order to protect them from being affected to any considerable extent by sudden changes of temperature, it is advisable to cover them about 1 inch thick with straw made very dry by exposure to the sun, or by placing it on a kiln. The straw will absorb any moisture that may arise from the fruit, which will ripen of a fair colour and be more plump than if fully exposed to the air.

The most essential points in keeping Apples are coolness and a steady temperature, with no greater circulation of air than is absolutely necessary to prevent exhalations from accumulating, and they should be kept in the dark. When hermetically enclosed, fruit becomes in-

sipid, although it may seem quite perfect as regards external appearance. Consult vol. i., chapter xvii., p. 210, for information on the best methods of storing fruit.

Propagation.—The Apple may be increased in several ways, but different methods are adopted for perpetuating the varieties, and to obtain stocks upon which to place them. For the first-named purpose by far the most important are



Fig. 869.—Orr's storing trays for Apples, &c.

budding and grafting, which are now very extensively employed, indeed it may be said almost exclusively. Inarching is occasionally resorted to, and cuttings still more rarely. To obtain new varieties and free stocks for budding, &c., seed-raising is the method, while for dwarfing or Paradise stocks layering is the plan followed. As all these are described in detail in other chapters it will not be necessary to refer to them further here except with regard to seed-raising and grafting, which demand a few words.

Seeds selected from fruits that have been obtained by special cross-fertilization, or which have been chosen from the fruits of good varieties with the object of raising new sorts, are best sown in deep pots of light soil in a frame or cool house. The seeds should be sown soon after they are thoroughly ripe, and

must be protected from mice, which are very partial to them. Sow thinly and do not let the young plants remain long enough in the pots to become stunted. Crab seeds for stocks are best sown out-of-doors, and the method adopted in raising free stocks from the seeds of Apples employed in the manufacture of cider can be followed. In Normandy, where Apples are extensively cultivated, the pomace is taken and rubbed between the hands in a vessel of water, in order to separate the pulp from the pips. After allowing some time for settling, a part of the contents of the vessel is poured off so as to get clear of the pomace and bad seeds, the pips at the bottom being the only ones that should be made use of. These are dried, and kept in a dry place till they are sown. The sowing is then performed as soon as the sharp frosts are over, as the seeds do not long preserve their germinative powers.

The soil in the seed-bed is prepared by being finely pulverized, and enriched with manure. Drills are made 1 inch deep, and from 7 to 9 inches apart, and in these the seeds are deposited, then covered with fine soil, and afterwards rolled, or pressed close with the back of the spade. It is sometimes advisable to mulch the surface, to prevent its becoming too dry. When the plants are 1 or 2 inches high, they are thinned in rainy weather; otherwise the seed-beds should be watered, to settle the earth about the roots of the plants left. In thinning, care should be taken to leave the strongest plants. The bed must be kept stirred and clear of weeds.

When a year old the plants are selected for transplanting. Stout plants are preferred to tall ones. In light soils transplanting takes place in November, but in strong ones in February or March. The plants are put in at from 20 to 24 inches apart, in rows distant from each other 40 inches. In light soils the rows are made to run east and west, but in cold soils north and south, in order that the rays of the noon-day sun may penetrate between them and warm the ground. The stem is not shortened in the same year in which transplantation takes place, unless it is very tall and slender, and then the third, or one-half at the utmost, is cut off, but at the same time a sufficient number of buds is left to produce plenty of leaves, for these encourage the formation of roots.

If it is intended to graft the trees standard-high (though this is rarely practised now), the upward growth of plants that are inclined to grow straight should be encouraged, by pinch-

ing the young shoots on the sides, in order to divert the sap into the terminal shoot; and such plants as are crooked ought to be cut down to obtain a vigorous upright shoot.

The shoots on the young stem should be preserved until it has attained a sufficient size to be grafted, but they must not be allowed to grow too large. They ought to be shortened to 8 inches or 1 foot in the beginning of June, earlier or later according to the season. The stubs or shortened shoots left on the stem should not be cut off at once, but partial removals should be annually made in autumn or spring. They should be removed by an upright cut, at about one-tenth of an inch from the stem, and parallel to the circular wrinkles or rings at the base of the shoot, for if cut off in the direction of these the wound soon heals.

The above are the essentials of what is considered, in Normandy, the best mode of raising Apple-trees from seed, and of rearing them with a tall stem, fit for standards. In this country they are raised for stocks nearly in the same manner, but they are transplanted, first from the seed-bed, again when they are strong enough for bedding out, and finally when they are to be placed in nursery rows.

Grafting.—Any of the methods detailed in the chapter on grafting may be employed, but of all others whip-grafting is to be preferred. It may be well, however, to remark, that the stocks should be grown in well-manured soil, so as to be healthy and vigorous, and at least as thick as the finger. They ought to be pruned back to where the graft is to be placed, in January if the weather is not too severe, but in any case before vegetation becomes active. It is not advisable to cut them down in hard frost, as in that case small splits often take place at the wounded part. If the weather permit, the heading-back should not be deferred to a later period than the end of January or beginning of February.

The scions ought to be cut from the healthiest trees that can be found. Where canker is observed in any part of a tree, the apparently healthy shoots from that tree should not be taken if others can be obtained from a healthy one. They ought to be cut in January, but not when they are in a frozen state; and to preserve them till the time for grafting arrives, a spade-deep trench should be dug out from east to west, throwing the soil on the south side, so as to form a ridge, on the north side of which the cuttings should be laid in, but not in bundles, the inner portion of which would be

hardly, if at all, in contact with the moist soil, and would consequently be apt to become dried up. Each cutting should have its side laid against the slope of the trench, and its end in contact with the soil at the bottom. The lower portion of the cutting must then be covered with soil, which may be drawn up to nearly its entire length, and pressed close. Scions may also be preserved until the time of grafting, by sticking their ends in moist sand; and they may be kept alive for a year by shortening them a little, and inserting to the depth of 5 inches in moist, shaded ground. Treated in this way, we have seen cuttings taken in January, and grafted successfully in the March of the following year, fourteen months after their removal from the tree.

Grafting is performed close to the surface of the ground for dwarf trees, and also for standards when the sort worked is calculated to form a good straight stem, as is the case with many of the strong-growing kitchen Apples.

Budding is generally preferred to grafting because it is more expeditious, and with young stocks an excellent union is obtained.

Disease.—The diseases of fruit-trees are included in the chapter dealing with plant diseases generally, to which readers are referred for full particulars respecting causes and remedies or preventive measures. From a cultural point of view simply, much can be done, however, to minimize many attacks, and it is to this part of the subject which we now draw attention. A healthful tree is rarely subject to severe attacks, and they can be more successfully dealt with in any case. The cultivator must therefore endeavour to render the conditions in which a tree is growing as favourable as possible.

Canker, it is well known, attacks some varieties more than others growing in the same soil. Hence, it must be inferred that some varieties are constitutionally more disposed to this disease than others; again, in some soils almost every variety is more or less subject to canker, whilst in others the whole of them are comparatively free from it. Amongst predisposing causes to attacks of canker are sudden checks to the vegetation of the tree, especially in spring and the early part of summer, from vicissitudes of heat and cold, as well as of moisture and dryness, unskilful and severe pruning, and deleterious substances in the soil or subsoil.

When a tree grows rapidly in consequence of high temperature, and is then suddenly checked by cold, small lateral shoots, that have pushed to the length of 1 or 2 inches, are apt to die, and

in that case canker appears round their bases. As soon as this is observed, the dead shoot should be cut in very closely to the branch from which pruning unquestionably favours the attacks of canker. If it attacks varieties that are not usually subject to it, and if the trees have not

suffered from any of the above-mentioned causes, the evil may reasonably be attributed to some defect in the soil. If the canker is evidently increasing, and if the trees are not too old for removal, they had better be taken up, and the soil ameliorated by trenching and other means. In some cases a considerable portion of a bad substratum may be turned up to the top, where it will be comparatively harmless, and besides, by exposure to the weather, and by cultivation, it must there undergo a change for the better; and when the soil turned down from the top to the bottom is reached by the roots of trees, the latter generally thrive well.

Mildew frequently attacks the foliage of the Apple, and sometimes the extremities of the shoots. The soil should be examined, and care taken that it is not at any time too dry at the extremities of the roots. Taking up the tree, trenching the ground, and re-planting, have often proved beneficial.

Moss and lichens should be scraped off, but it is better if the trees can be made to thrive so well as to throw off the old bark, moss and all, as we have seen ill-thriving, moss-grown Apple-trees do, in consequence of draining the soil. After scraping the bark, brushing the branches with a solution of soft soap and caustic soda, well working it in, has been found an effectual remedy.

Insects.—For information respecting the insects that attack the Apple see chapter xi., in which the following are treated upon:—

Bark Enemies.—American Blight, Apple Mussel Scale, Woeberian Tortrix. *Bud and Flower Enemies.*—Apple Blossom Weevil. *Fruit and Seed Enemies.*—Apple Saw-fly, Birds. *Leaf Enemies.*—Apple Aphid, Brown



Fig. 870.—Canker in Apple branches.

1. Injury caused by branches rubbing: a common wound, favouring the invasion of canker. 2. An early stage in canker, probably due to improper pruning leaving a rough exposed surface. Excision and dressing a possible remedy in this case. 3. A more advanced stage of canker injury; excision still possible, but the results doubtful. 4. Branch practically destroyed, entire removal the only course.

it springs, the cankered wood and bark cut away, and the wound dressed with tar. If this is done when the tree is in full growth, the wounds

times the extremities of the shoots. The soil should be examined, and care taken that it is not at any time too dry at the extremities of



Fig. 871.—Canker in Apple branches: various stages of healing after excision and dressing.

1. A slight injury, nearly healed. 2. A larger wound, healing proceeding favourably. 3. A very long wound, branch healing slowly. 4. A large stem and deep wound, healing but leaving an unsightly scar.

will heal rapidly. If canker appears where the soil has not been drained, draining should be immediately proceeded with, and beneficial results will certainly follow. Severe and untimely

Blight, Apple Mussel Scale, Woeberian Tortrix. *Bud and Flower Enemies.*—Apple Blossom Weevil. *Fruit and Seed Enemies.*—Apple Saw-fly, Birds. *Leaf Enemies.*—Apple Aphid, Brown

Tail Moth, Figure-of-8 Moth, Garden Chafer, Lackey Moth, Lunar-spotted Pinion Moth, Mottled Umber Moth, Pale Brindled Beauty Moth, Pear-leaf Blister Moth, Red-footed Beetle, Small Ermine Moth, Winter Moth, Yellow-Tail Moth. *Root Enemies*.—Cockchafer. *Stem Borers*.—Apple Clearwing Moth, Goat Moth, Stem-boring Weevils, Wood Leopard Moth.

APPLES FOR MARKET.

The disposal of surplus garden supplies of Apples, as well as of other fruits, is now so general that it is necessary gardeners should have some knowledge of the commercial side of fruit culture. In the early stages of their career it is difficult to gain the requisite information, unless they serve in establishments where marketing is carried out on a business basis; but no opportunity should be lost in that direction. Apart from the sale of surplus produce, the number of plantations founded solely for commercial purposes is increasing, and there is a demand for practical men who are familiar with the duties of such positions. It is desirable, therefore, that all young men engaged in horticulture should be well informed on the whole subject, both as to the prospects, the difficulties, the methods, the expenses, and the results. It is the purpose of the following hints to convey an idea of the commercial aspect of Apple culture, which may be modified according to varying circumstances, and adapted to either small or large undertakings. Though specially directed to the requirements of Apple growers, most of the particulars will be found to have a bearing upon the market culture of fruits generally, as they embody the results of many years' experience in several counties and under widely different circumstances.

Present Position and Prospects.—In devoting some attention to a consideration of the possible profits derivable from Apples, it may be desirable to review the condition and prospects of the industry, for erroneous ideas in both respects have been productive of much mischief. Enthusiastic support of a good cause is always welcome, and where there is a stimulating influence of this character optimistic views are likely to preponderate; and so long as these do not lead to misstatements, calculated to cause the uninitiated to form undue expectations, no evil may result. Unfortunately, however, some advocates have materially damaged an excellent cause by indulging a rather too prolific imagina-

tion, or by founding their statements on imperfect or partial evidence.

It has been urged that the land cultivator, to ensure prosperity, should plant acres of Apple-trees. On the strength of this some have invested a considerable amount of capital, and then construed their instructor's advice so literally that they have thought and acted as if nothing more were needed than to wait for the result. Experience moderates enthusiasm. We are thoroughly convinced of the benefits which, under the right conditions, can be derived from Apple culture. Still, we have been so impressed with the evils arising from extravagant statements that induce persons to enter a business for which they are unqualified, and under circumstances which do not afford a reasonable chance of satisfactory results, that we are compelled to urge caution on the part of would-be beginners.

The cultivation of hardy fruits is a pleasurable and healthful occupation to those who have vigour of body and mind, who are able and willing to work, who are naturally persevering, not easily daunted by difficulties, who are energetic, resourceful, and quick to adapt themselves to circumstances. For such men, adding the essential knowledge and experience of the business, there is ample room. Keen as the competition may be, they can make a living, and may even do more than this. They may be able in the course of years to contemplate a comfortable balance at the bank as the result of well-directed labour.

If it were possible to obtain the exact figures, we should probably find that the total amount of fresh or preserved fruit consumed in this country is nearly double what it was a quarter of a century ago. The increased attention paid to dietetic matters can only result in still further advance in this respect, though we do not anticipate that the Briton will ever entirely subsist on a fruit and vegetable diet. There can, however, be no question respecting the advantages of plentiful supplies of good fruit and vegetables in improving the health of the people; and this is becoming so generally recognized, and is so frequently enforced by the highest sanitary authorities, that it would be safe to predict an even greater proportionate demand than now exists. The British fruit grower has therefore nothing to fear on the ground of demand, but what he has to face is the competition of cultivators in other countries who are less heavily burdened. This, it must be admitted, is now formidable.

When our own growers prepare fruit for market, they have to remember that not only have they to compete with their neighbours or fellow-countrymen in other counties, but they have to contend with enormous supplies from abroad. Supplies, too, that, in the case of Apples, usually arrive in an excellent condition, well packed, tastefully displayed, and of uniform quality. Briefly, therefore, British growers must not only possess a thorough knowledge of their work, with all the qualities requisite to success in a difficult business—they have not only to contend with climatic peculiarities of an exceptional character, heavy expenses and high carriage rates, and to compete with home growers, but they have to equip themselves for a still fiercer conflict. On the other hand, there is no danger of a falling off in the demand for fruit, and the producer who is close to his own markets ought to stand the best chance in the struggle as compared with those who are many hundreds, or even thousands, of miles away.

Preliminaries—Business Methods—Economy.—If we can form an accurate idea of the matters in which our business rivals excel, and if we can remove the most prominent defects in our own methods, we are certainly advancing on the road to success. As cultivators generally British growers have nothing to fear. Their skill is unquestioned, and their keenest rivals freely admit their superiority, but they are occasionally lacking in some other respects which have a material bearing upon financial results. A business man in these days who expects to command a share of success must be methodical in his work and economical in his expenses; he must provide a good article at a moderate price; and he must present this for sale in a form that will attract buyers. Method can be displayed both in the commencement and the routine of Apple culture, and it all means economy of the right kind, namely avoidance of waste. It is on this basis that we advocate economy in land, economy in labour, and economy in materials. It does not mean a reduction in the amount of labour, or the payments, but it does mean that waste of any kind must not be tolerated. Economy is effected by a well-considered system of planting. We should endeavour to secure the utmost the soil will produce without permanent injury.

The true economy of labour may be summed up as "efficiency". That is the employment of skilled and well-directed labour sufficient to accomplish the required work at the best time, and under the most favourable circumstances.

It applies to all the operations of Apple growing, planting, pruning, gathering, sorting, and packing. Much is lost for want of knowledge or carelessness in execution, and this is generally the result of cheap labour. An employer who has a long labour bill to meet every week may well be excused for wishing to reduce it, but he often errs by the substitution of lower rates. It is better to find out the most intelligent men or lads, and, if possible, teach them, and encourage them to work with their brains as well as their muscles. Attentive, thoughtful men, who take a true interest in their work, are wanted to assist in the competition of the day, and they should see that they have a common interest with their employers.

Essentials.—Beyond the requirements of good soil, favourable aspect, and other conditions, which have been fully described in the chapter on Orchards and under the general culture of Apples, there are several matters to which the market grower must give his attention in selecting a position. If the undertaking is on a moderate scale, and it is intended to chiefly depend upon local markets and home sale, the district must have most careful consideration. There are many country districts which are at the present time inadequately supplied with home-grown Apples, and there are others where the local produce is ample to meet the demand. This, in consequence, should be ascertained carefully, as if a mistake is made the system of marketing will have to be altered or failure must result. When a good local market is found, the proximity to a railway-station is of little importance provided there are good roads. With well-constructed carts, and due care in packing, it is possible to convey such fruit as Apples 12 to 15 miles direct to the market, shopkeeper, or consumers with greater economy, greater despatch, and greater safety than when sending by rail. This obviously affords the grower a better chance of selecting suitable land at a moderate rent than if it be very near a station or a town. For larger plantations, where other markets will have to be utilized, the distance from a station must be taken into consideration, as much time is wasted and great expense is incurred in carting large quantities of fruit to the rail. But there is one point here worth attention, namely, it is often preferable in every way to cart produce a few miles by road and put the consignment direct on a main line, than to send them on a branch line where either delay or transference of goods to other trains is necessary on the way.

As regards the large establishments, another matter is of great importance, namely, the availability of labour in the district. This does not affect the routine work so much as the periods of pressure, either for land-cleaning or fruit-gathering, but at such times it is serious if sufficient labour of the right kind is not obtainable. Where market-gardening and fruit-growing is an established industry, more skilled or practically-trained workmen are usually to be had, at a higher scale of wages, of course, than in country districts at a distance from a town. In the latter case, if villages of from 400 to 600 inhabitants are within a mile or two, women can often be had for the lighter work of gathering and packing, and with a little tuition prove both useful and reliable. The more intelligent lads should also be engaged as they leave school, and if they can be sufficiently interested in the work, and afforded due encouragement, they become useful assistants in a short time. Anyone who starts in a rural district must be prepared to face these difficulties, and if they are overlooked at the commencement it will only cause increased trouble later on. In extreme cases arrangements are occasionally made at fruit-gathering time, when sufficient labour is not obtainable in the district, to convey helpers by road or rail from the nearest neighbouring town, but this is seldom necessary where Apples alone are grown, though it is often requisite where large mixed plantations are formed in which Strawberries or other small fruits preponderate.

Land Tenure.—Though surrounded by many difficulties still, it is possible now to ensure some security for outlay to a man who plants Apple-trees or other fruits on land of which he is not the owner. Recent acts of parliament have provided that fruit plantations formed upon land let for market-garden purposes are subject to valuation at the end of the term for which the land is held, with compensation to the outgoing tenant. But in other cases it is rarely difficult to obtain an agreement with the landlord, or his consent to the planting (which is practically equivalent). For a man who is about to invest a considerable amount of capital in planting, there can be no question that it is preferable to secure the freehold of the land if possible, especially as the purchasing-price at the present time is generally low, except near towns. Frequently, however, it is extremely difficult to obtain freehold land in suitable districts, and of the desired extent.

Large farms or estates are often offered for sale, the major portion of which would be unfitted for fruit, and moderate-sized plots of from 20 to 50 acres are rarely obtainable with a house. It is much easier to rent land on lease, as occasionally, when large farms fall into the hands of the owner, they may be divided, or a few fields separated for the purpose. For the benefit of the tenant who intends planting Apple-trees to form a lasting plantation, the longer the lease the better, and anything less than twenty-one years is not of much value, unless there is an equitable arrangement for renewal at the termination of shorter terms.

Methods.—The principal systems of arranging trees in plantations are described and illustrated in the chapter on Orchards; it is only needful therefore to briefly recapitulate the methods which are practicable and profitable.

A. Apples without other fruits.

Under this head the chief systems are:

1. Apple-trees with intercropping of vegetables, or flowers.
2. Apple-trees in open cultivated soil, without intercropping.
3. Apple-trees in grass.

The last is the least desirable method, as it is not adapted for dwarf trees. Where standards are employed, some years should elapse before the grass is allowed to extend to the tree stems, and poultry-keeping may then well be combined with such a system.

B. Apples in conjunction with other fruits.

Necessarily this offers the widest scope to the fruit-grower for market, but it also requires a larger outlay at starting and in subsequent maintenance; but in a well-devised system there are earlier and heavier returns, a matter of the greatest importance where capital is limited. To some extent the constitution of such mixed plantations should be regulated by the distance from the markets to be principally depended upon. For the home trade and local markets Strawberries and Raspberries are profitable, while for the more distant markets Gooseberries for gathering green, provided the fruits can be had early, are more serviceable.

Expenses.—Whatever may be the amount of capital at the command of the cultivator who is about to launch out into Apple-growing for market, it is essential that the expenses to be incurred should be carefully reviewed. Numbers have failed, who were in all other respects well qualified to succeed, simply because they have not enquired into the question of expenses

exhaustively, or because they have under-rated some of the leading items.

In the purchase or rental of land for Apple-growing there is a wide range in the probable expenses, depending upon the quality of the soil, its condition as to cultivation, its accessibility, and proximity to or distance from towns or stations. We know instances where good land is let for fruit culture at from £1 to £10 per acre, and in some cases, at a distance from a town, small farms of about 100 acres are let at as low a rental as 10s. to 15s. per acre, but in such instances a large portion of the land is unsuitable for Apples, and probably difficult of cultivation with any crop. It is seldom, even in purely agricultural districts, that good land in plots from 10 to 20 acres is obtainable at less than £2 per acre, and in very favourable localities this may rise to £4 or even £5 per acre. From these facts it is possible to arrive at some idea of the freehold value, and though from 25 to 28½ years' purchase are the limits usually assigned for farm land, yet it has been possible to buy at less than this in recent times, namely, 20 to 22 years' purchase. This would not, however, apply to land near towns, which might have a prospective value for building purposes.

In taking land for the special purpose we have in view it is needful to ascertain whether it is efficiently drained and fenced, or otherwise after-expenses may be incurred that will make a substantial addition to the outlay. Again, there is the actual condition as regards cleanliness to be considered, for foul land may mean trouble and expenditure in labour for years. With reference to fences, it will be necessary to decide between the merits of a "live fence" and a "dead fence", *i.e.* hedges and rail fences respectively. The disadvantage of a hedge is its liability to become a refuge for insect pests, and as regards old hedges this is often an evil of a very serious character. A young hedge, with due care in spraying, can be kept clean and form a useful boundary; planted with Quick Thorn, at 4 inches apart, with protective fences and ditch, such a hedge will cost from 1s. to 2s. per yard run. On strong fertile soils the Cherry Plum (*Myrobalan*), at 1 foot apart, will form a useful fence at less cost than Quick Thorn, as the price is only about 25s. per 1000 transplanted seedlings.

Should tile drainage be essential, the cost may vary roughly from £3 to £6 per acre, according to the soil, the depth, and the distance between the lines, but if the subsoil be

clay the extreme amount may reach £8 or even £10.

For protection purposes the expense incurred, if Poplars are used, is chiefly in the planting, as the trees themselves are cheap, and strong, young transplanted trees, 3 to 5 feet high, can be purchased at £2, 10s. to £5 per 1000, according to their condition and the variety. Norway Maples and Sycamores can be had for £2 to £3 per 1000, while if mixed plantations are to be formed Larch, Spruce Fir, and Scots Fir can be had (in smaller sizes) at the prices already named. The expenditure in this direction is not, therefore, a heavy item, unless long belts of trees are required by the position or shape of the plantation.

The expense of soil preparation or cleaning may be one of the most serious items, depending chiefly upon the condition of the land and whether horse or hand labour is employed. If ordinary ploughing and harrowing suffice on soil of moderate texture and fairly clean, 20s. to 25s. per acre will be the average cost. Single spit-digging or forking by hand labour costs from £2 to £4 per acre, but the last-named amount will be increased materially where the land abounds in Twitch. If a season's course of cultivation and cropping be adopted for cleaning the land, the preparatory expense may be greatly reduced, or even wholly extinguished, by the sale of the crops. The digging and trenching of the spaces only that are to be occupied with the trees would, in the case of dwarf Apples, at 12 feet apart, with prepared spaces 2 yards square for each tree, reduce the outlay to a little more than one-fourth of that where the whole ground is cultivated. When the trees are to be planted in rows, with bush fruits between them, and intermediate spaces of 30 feet for other crops, preparing the land in the rows 2 yards wide by hand labour will effect a saving of about one-half, if horse-power can be employed for the other parts.

Trenching in the best land for Apples is a costly process, and though it may be undertaken in gardens or plantations for special purposes, it is rarely essential in a plantation exclusively for profit. The cost per acre on heavy soils will be from £10 to £13 for either ordinary or bastard trenching, and if besides this a thorough subsequent forking is necessitated by the state of the land, the total may exceed £20, an amount of capital that a market grower could not afford to sink, especially as he could secure satisfactory

results by the much smaller outlay already indicated.

The provision of roads in the plantation must be considered; but in some districts, where suitable materials have to be carted a long distance, the expense is practically prohibitive to a market grower, and in consequence the work cannot be done as thoroughly as might be desired. Near large towns the coarser refuse, cinders, &c., can often be readily obtained, and the basis of serviceable roads may be thus formed cheaply. In districts where clay abounds, if small coal can be had at a moderate price, hard burnt ballast is useful, but in wet or soft land it does not make a lasting road if there is much heavy traffic. Coarse gravel, stones, or similar durable materials vary greatly in price, and it is difficult to quote average rates. A rough road may cost between 3*d.* and 1*s.* per square yard, but the last-named figure should only be reached where materials are costly or where, owing to the nature of the land, extra thickness of material is necessary.

The next important item in the expenses is obtaining the trees, either by purchase in a nursery or by raising them. Well-established Apple-trees, both dwarfs and standards, can be had in quantity at all the best nurseries at very moderate prices, ranging, according to age, condition, and variety, from £3, 10*s.* to £5 per 100. They can be raised by the grower himself, at about £2 or £2, 10*s.* per 100, by budding on bought stocks, but there are serious losses to count against this, which may be increased if the budder is lacking in experience. Many market growers, however, are now practically nurserymen also, and not only raise their own trees, but also sell their surplus. It is well to have a few stock trees true to name to furnish buds of the required varieties, as sometimes they are difficult to obtain when needed, except at extravagant prices. The same remark applies to scions for grafting, but to obtain the numbers for a large plantation, trees of good size are needed.

Planting and staking constitute a portion of the expenses of establishing an Apple plantation, but if one- or two-year-old dwarf trees are selected, the staking can usually be dispensed with. Planting can be done by piece-work at an agreed price per 100 trees, but this is not an advisable procedure. It is preferable in all ways to entrust this work to careful men, under the personal supervision of the grower. Where the ground has been pre-

viously prepared, the holes for the trees can be taken out immediately in advance of the planters, and the two operations need not exceed 1*d.* to 2*d.* per tree for large areas; on small plantations the average cost would be rather greater. Taking young dwarf and standard Apple-trees, with staking where necessary, £1 per 100 may be regarded as a fair inclusive charge for the whole work of planting and the first pruning, if performed immediately. Other expenses must be included in the first outlay on a well-organized plantation, such as the provision of tools and labour-saving appliances, which may range between £5 and £10 for small plantations, or at the approximate rate of £2 per acre for larger ones. A horse or pony and cart will be required wherever general cropping and home marketing are carried out. Much labour can also be saved on a plantation by the use of a horse or strong pony if some of the best forms of light cultivators are employed.

The provision of storing-, sorting-, and packing-rooms also needs attention; but if sheds or similar out-buildings already exist on the place, they can usually be readily, and with small expense, adapted for the desired purposes. If, however, they have to be erected, it is a rather serious matter on small undertakings.

An excellent fruit-room is that shown in figs. 872, 873, and is in the gardens of Foxbury, Chislehurst. It is handsome in appearance, simple in construction, comparatively inexpensive, and in every way satisfactory. It is 35 feet long, 15½ feet wide, and 16 feet high. The walls are formed with match-boards and reeds, the latter being about 7 inches in thickness, and kept in place by strips of wood fixed horizontally at equal distances apart, as shown in the illustration. The base of the walls is formed with concrete, and the floor is formed of the same material. Access is obtained to the structure by double doors, one opening outwards and the other inwards, the duplication of the door being for the purpose of preventing the fruit being influenced by the temperature of the external air. A ventilator is fixed over the door, and at the other end of the fruit-room is a window with a ventilator over it, and from this window sufficient light is obtained. Internally the fittings comprise a central set of shelves arranged in four tiers and 4 feet wide, and a range of shelves round the side 2 feet 6 inches wide, and also in four tiers. At the end of the central shelves next the door a fixed

table 4 feet by 3 feet has been provided for packing and for the fruit selected for dessert. The shelves are made with deal laths 3 inches wide, and with slightly rounded edges to prevent injury to the fruit. Eighteen inches is allowed between each shelf, and this is found sufficient to allow of the fruit being readily examined.

Beyond this, the water-supply may occasion some expense, as, wherever spraying is system-

atically and thoroughly carried out, sufficient water must be at command whenever it is needed. Near towns the usual services are available, and, though costly, are convenient; in rural districts, wells and water-sources have to be depended upon. Well-sinking is expensive work, especially in some soils; while if the water has to be raised to higher levels from rivers or brooks, rams in some form will

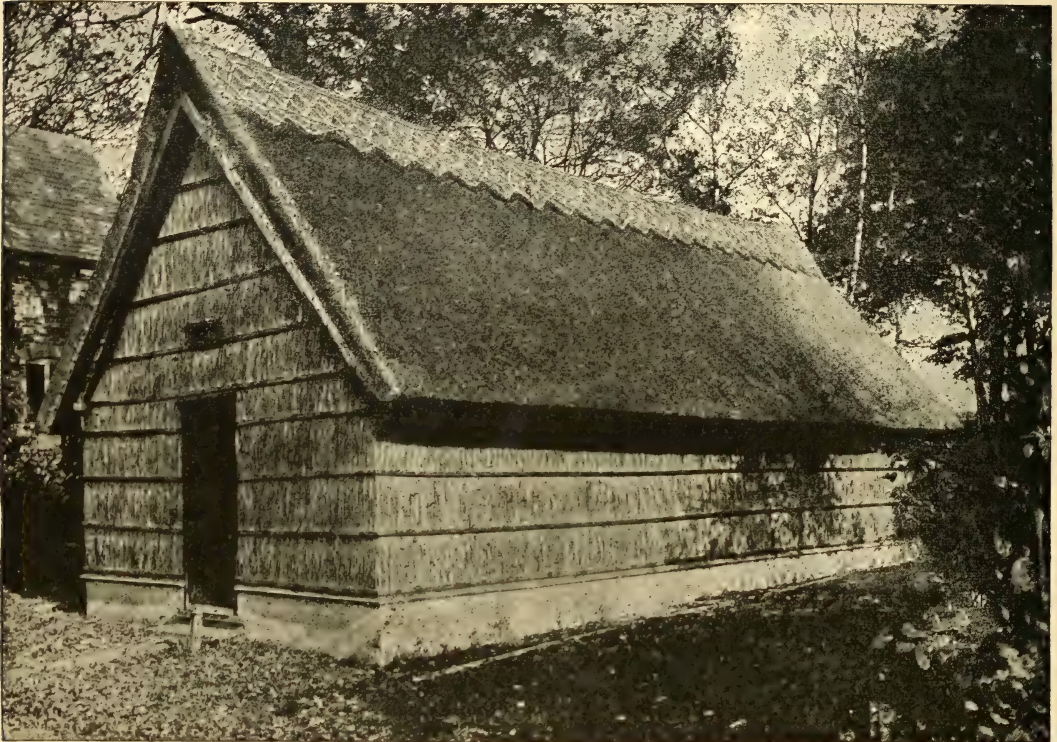


Fig. 872.—Fruit-room at Foxbury, Chislehurst.

be necessary, or the light iron or steel wind-mills, now frequently used, are serviceable and essential in all extensive plantations. If capacious tanks are placed on the most elevated part of the land, or sufficiently raised for the purpose, the water can be distributed by gravitation, the expense of the requisite pipes being a profitable set-off against the hand-labour otherwise needed.

Working Expenses.—The cost per acre of conducting and maintaining an Apple plantation for market supplies must necessarily be influenced by many circumstances. The extent, the methods of planting and cropping, the nature of the soil, the freedom from weeds or the reverse, the system of sale adopted, and how far horse labour can be substituted for, or utilized as additional to, hand labour. The proportionate expenses are greater per acre in the smaller undertakings, but will be

materially modified by the part taken by the grower himself; if he exercises an active superintendence and takes a lead in all work the reduction may be considerable. As regards the number of hands required permanently, or at least for the greater portion of the year, it may range from one man per acre up to one man per 4 acres, with a lad for every two or three men. This will suffice for the routine work, but extra help would be needed at fruit-gathering on most plantations from 5 acres upwards. Gathering apples can be done by piece-work where the permanent labour is not equal to the task, and the cost will be from 3*d.* to 6*d.* per bushel, in an ordinary way, depending upon the size of the fruit, the crop, and the size of the trees. In the case of large standards, where ladders have to be used and the work is necessarily slow, the

cost will exceed 6*d.* per bushel, and then becomes a heavy and serious item if prices are low. Sorting, packing, and storing Apples are preferably performed by the regular workmen, and may therefore be included in the routine expenses.

If the fruit is sent direct to a wholesale market, most salesmen provide baskets, so that in such cases the grower is relieved of a heavy expense; but for home and retail trade he requires either boxes or baskets of his own. Baskets are expensive, but when well made are very durable, especially the "rounds", such as half-sieves and bushels, which may cost from 18*s.* to 30*s.* per dozen, or, where several hundreds are required at a time, lower quotations can be obtained. Boxes are slowly coming into more general use in the British trade, and they can be purchased of several large firms at moderate prices. Some of the railway companies also now provide boxes, but the sizes for holding half a bushel or a bushel of Apples are too slight to stand much travelling and they are too expensive to be given with the fruit. Where boxes are used the best plan is to employ the permanent hands in making them during wet or bad weather in the winter. In this way, if the wood is bought in quantity, ready sawn, it is possible to produce useful half-bushel boxes at 6*s.* to 8*s.* per dozen that, with ordinary care, will last for several years. Some salesmen estimate that their baskets cost them 2*d.* each per journey, but this is excessive, and includes the value of those lost. A well-made box properly stamped to ensure its return does not cost half that. In the case of choice dessert Apples, packed in boxes to hold from 1 dozen to 2 dozen, the box can be given with the fruit, for they can be purchased ready-made at 1*s.* 6*d.* to 2*s.* per dozen.

Railway carriage rates for Apples are heavy enough, but they are the lowest charges made for any hardy fruits, and they may be taken approximately at from 4*d.* to 1½*d.* per ton per mile for distances above 50 miles and up to 200 miles, the shorter distances paying the higher rates. But less than 6 bushels or 12 half-bushels, which, with the boxes or baskets and packing would amount to about 3 cwts., cannot be sent at these rates. For distances of 10 or 12 miles it is often cheaper to send Apples by road, as previously indicated, as it should not cost more than 6*d.* per ton per mile, provided at least one ton can be sent each journey.

Market charges are usually so much per basket or box, and rarely exceed 1*d.*, while

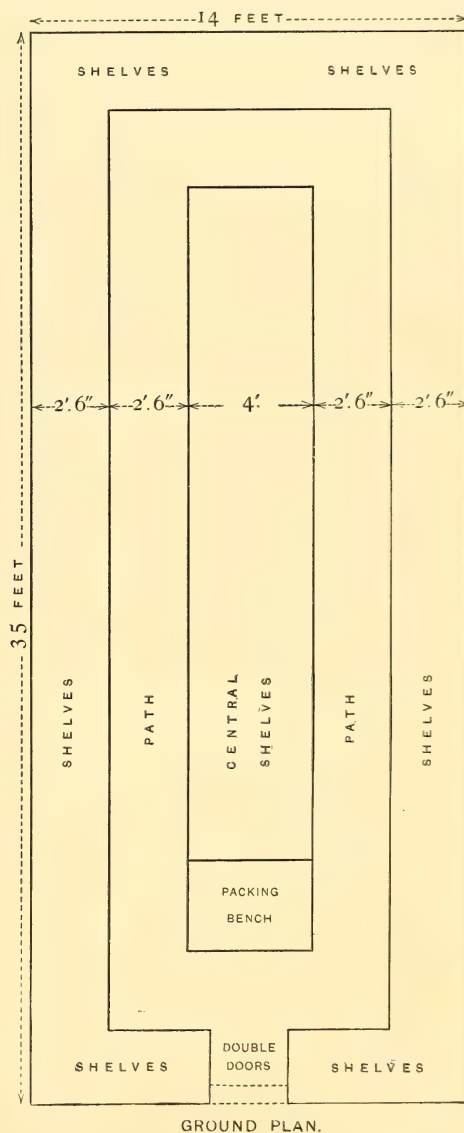
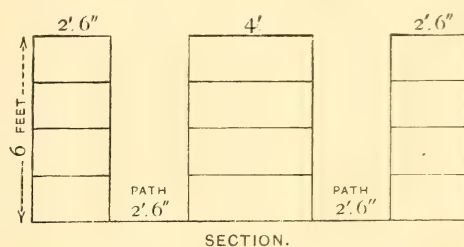


Fig. 873.—Section and Ground-plan of Fruit-room at Foxcury.

salesman's charges may either be a fixed percentage on the value of what is sold, or, more commonly, a rate of 4*d.* per half-bushel and 6*d.*

per bushel is charged irrespective of the selling prices. Obviously, when the market rate is low, this falls heavily on the grower, as after rail charges are deducted he probably secures only 50 per cent of the selling price. Some large growers meet this difficulty by becoming their own salesmen, but this can only be satisfactory when there is an extensive and general business, so that a continuous all-the-year-round trade is conducted. Smaller growers succeed best by more direct communication with the consumers, or at least with fruiterers and green-grocers.

There are several other expenses of a minor character, such as the cost of materials for spraying, &c., that need not be particularized. The use of manures will depend upon the system of intercropping adopted. On substantial soils for Apples this need not be a serious item for some years, or when heavy crops of fruit begin to try the strength of the trees.

Prices and Profits.—To gain something like an approach to an accurate knowledge of the market value of Apples the whole matter requires to be studied very carefully in all its bearings. The use to which the fruit is applied, *i.e.* for cooking or dessert; the season when it is available: early, mid-season, or late; and then under each of these, size, colour, and quality affect the prices; which are again still further influenced by home crops, by the American crops, and later in the season by the colonial supplies. With all these complicated conditions it is not surprising that prices vary enormously, and sometimes with a rapidity that seems mysterious to the inexperienced.

Dessert Apples that are distinguished by earliness, good appearance, or quality, almost invariably command fair prices and frequently yield very profitable returns. Some growers rely almost exclusively upon such varieties as Devonshire Quarrenden, Yellow Ingestrie, Worcester Pearmain, and Cox's Orange Pippin, which may range from 6s. to 14s. per bushel in the market, and extend from August to January. There are, however, many Apples of good appearance, though not of high quality, such as Duchess of Gloucester (or Duchess's Favourite), which command a ready sale for eating, especially in some seasons. The demand for early cooking Apples is also considerable, but market prices rule lower for these, and rarely exceed 4s. to 6s. per bushel, except for unusually early or very fine samples in a season

of scarcity. The selling advantage of cooking Apples is the long general demand that exists for them, and the heavy crops that are usually obtained from healthy trees of the best varieties. As regards season, if Apples can be disposed of before the American supplies lower the prices, or after they are exhausted and before the Tasmanian Apples reach our markets, it is to the advantage of our own growers. But there is an increasing difficulty in this now, for the Tasmanian supplies have been increased and prolonged, and the first of the American Apples arrive earlier than formerly.

The importance of grading all Apples for market is being forced on the attention of British growers by their foreign competitors, and the money value of such sorting can be easily proved by any grower who will take the trouble to make the comparison. An example will serve to illustrate this. Of eight bushels of an early cooking Apple, half were duly sorted into three grades, the best = 1 bushel, the seconds = 2 bushels, and the thirds = 1 bushel. The last was not considered worth carriage, and was sold locally for 1s., the others, together with the four bushels of unsorted Apples, were sent to the same market and sold in one day as follows:—

GRADED APPLES.

1 bushel of best,	4s.
2 bushels of seconds at 2s. 6d.,	5s.
1 bushel of thirds (sold locally),	1s.
	<hr/>
	10s.

UNGRADED APPLES.

4 bushels at 2s.	8s.
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This shows a difference of 25 per cent in favour of the grading, and it is not an isolated example, dozens more could be mentioned of a similar character, some giving an even greater difference. There is no question that all the care which can be devoted to gathering Apples without injury, grading, and packing is well repaid in the higher prices realized, and this can be carried still further in the case of the choicest dessert varieties by displaying them to the best advantage in small quantities.

Size in Apples has a distinct market value, especially as regards cooking varieties, but to a less extent it also applies to dessert varieties, though as regards the latter colour is the more important quality. We have repeatedly had cases under notice where samples of such varieties as Cox's Orange Pippin, of equal size and quality, for eating, have differed in price from

APPLES

The Apple takes first rank amongst the hardy fruits cultivated in the British Islands. The innumerable varieties in cultivation are all descendants from the wild Crab-Apple, *Pyrus Malus*. There is evidence that Apples have been used as food by man for upwards of four thousand years; the evolution of the cultivated forms has therefore been a long and gradual process; but we owe the best of them to selection and cross-breeding within the last two hundred years. Until grafting became the general method of propagation, seeds were the usual means, and there are consequently an almost countless number of seedlings, differing from each other, which had their origin in this way. The majority of such seedlings are worthless and should be replaced by varieties of recognized merit. Seedlings raised from the pips of the very best Apples rarely possess the good qualities of the parent; on the contrary, most of them prove worthless. There are said to be about two thousand named sorts of Apples in cultivation.





2

3

APPLES:—

1, GASCOYNE'S SCARLET. 2, CHARLES ROSS. 3, ALLINGTON PIPPIN.

(Reduced)

10 to 15 per cent, the difference being in favour of the more highly-coloured fruits. It sometimes happens, in fact, that finely-coloured samples of an Apple that is of indifferent quality will realize a better price than the duller fruits of a superior variety. There is a limited demand for the highest quality Apples, unless they are recommended by other more evident properties, or unless they are popular varieties. For instance, Ribston Pippin and Blenheim Pippin are so widely known as "names" that in the shops it is common to see many other Apples displayed under those titles. Cox's Orange Pippin is also advancing rapidly in popularity, and a few others of merit are becoming known, but there are many excellent dessert Apples grown in gardens that would have but a poor chance in a market, as the probable purchasers who knew their value would be very few.

The varieties of Apples for market must combine many good qualities. They must be hardy, healthy, prolific, and regular croppers; the fruit should be large, or at least of medium size, preferably even and handsome in form, or brightly coloured. They should also be either early, late and good keepers, or of exceptional quality.

In the list given in another part of this chapter, some of the best proved varieties possessing these qualities are included, and their respective characters are indicated in the descriptive list.

From the review of the expenses attendant upon Apple culture for market, it is evident that all the qualities set out in our preliminary remarks are essential to those who would command a chance of success. Notwithstanding the outlay in starting and maintaining a plantation of Apples for profitable purposes, there is an ample chance of making the investment a profitable one, as many have proved in the face of numerous difficulties. But all the conditions should be as favourable as experience and judgment can ensure, and there must be but one object in view—commercial success.

It is difficult to gauge the actual average returns from a plantation, because the results depend upon a variety of causes, but where Apples are the sole fruit crop, it is possible to form an estimate that may be modified in different cases. If dwarf trees are principally relied upon, and about four hundred are planted to the acre, crops ranging from one hundred to five hundred bushels of fruits may be secured when the trees are fully developed and

in their best condition. These would include both cooking and dessert varieties, and at an average price of 5s. per bushel would yield from £25 to £100 per acre. Taking a series of years, the returns might fairly be expected to average £50 to £60 per acre, but examples could be cited where this has been far exceeded over a period of fifteen or twenty years. The net profits will vary in proportion to the skill exercised in the conduct of the business, but they usually range from 10 to 30 per cent on the receipts.

SELECT APPLES.

There are probably 2000 varieties of Apples in cultivation in the British Isles at the present time, a large proportion of which have distinctive names. Many of these are, however, either worthless or so much like others in general cultivation that they are seldom grown outside the locality where they originated. To all engaged in the commercial departments of horticulture, either as nurserymen or as market-growers, it would be a great advantage if the number of cultivated varieties could be materially reduced. There are few private gardens where large collections are required so long as a supply can be maintained throughout the year. But wherever much interest is taken in hardy fruits, it is a source of considerable satisfaction to have a collection that will show somewhat of the wonderful range of variation in form, colour, and flavour, which Apples present. Experience differs also as well as taste, and when certain varieties have been found to succeed better than others they are naturally in demand; this, in fact, is one of the principal reasons why so large a number of varieties continue to be grown, and nurserymen find it exceedingly difficult to reduce their stocks as they might desire.

Apart from the pleasure derivable from a large collection of good Apples there is a substantial advantage also, because it is found which varieties give the best and most constant results, and these can be increased accordingly.

The following list includes only those Apples which have proved satisfactory either generally or under some special conditions. The well-proved recent varieties are also included, and some of the older varieties which have been superseded by later introductions have been omitted. Old varieties of first-class quality that still maintain their position are, however, included, even though the fruits may be small

as compared with some modern productions. For dessert purposes many persons naturally object to large fruits, and although many varieties are indicated that can be employed either for dessert or cooking, in the majority of such cases the latter is the principal use, and the variety need only be taken to table when the supply of typical dessert varieties runs short.

The list is intended for reference as to the more important characters of the varieties, while the selections which follow will enable those who require a moderate number only to choose

what are likely to suit them. In every case the stocks referred to as "Dwarfing" or "Paradise", are the best types employed by British nurserymen, and not the pigmy stocks so often used on the Continent. The term "Free" stock includes both Crab and seedling Apples, unless the former is specially named.

Adams' Pearmain.—Dessert. November–February. Useful as a late variety, keeping well. Tree of moderate growth, forming a good bush on the Dwarfing stocks, and very prolific. Fruit medium, distinctly conical, yellowish with russet spots and red streaks. Rich flavour.

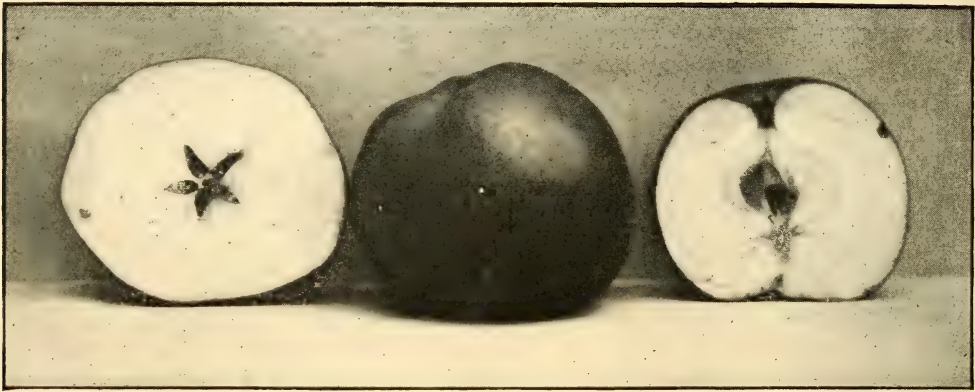


Fig. 874.—Apple. Beauty of Kent. (3.)

Alfriston.—Culinary. November–March. A late variety of free-cropping habit. Tree of moderate growth as a bush on the Paradise, and is best on the Free stock, either as a large open bush or a standard. Fruit very large, rounded and angular, yellow with some russet; juicy and of fine flavour when well ripened.

Allen's Everlasting.—Dessert. March–May. A very late keeper of considerable merit; it shrivels quickly and is worthless if gathered too early. Tree dwarf and compact as a bush, slender in growth. Thrives on both stocks, but is best on the Paradise in most soils. Fruit small to medium, yellow with red streaks, juicy and aromatic, can also be used for culinary purposes early in the season.

Allington Pippin (see Plate).—Dessert. November–February. A late variety of the Cox's Orange Pippin type. Grows vigorously and does well as a bush on the Paradise, or as a small standard on the Crab. Healthy and prolific. Fruit medium, round or conical, yellow streaked with red. Of good flavour on warm soils, and early in the season.

American Mother.—Dessert. October–November. Of American origin; has proved very satisfactory in Great Britain. Tree much branched, of moderate growth, free, adapted for the bush form on either stock. Fruit medium, round to conical, yellow streaked with red, sweet and aromatic.

Annie Elizabeth.—Culinary. December–April. A late keeper of excellent quality, much valued in the midland counties. Tree of moderate growth, erect and freely branched, healthy and prolific on the Paradise, also strong on the Crab, especially useful as a standard. Fruit large, round and ribbed, yellow with a red tinge. Late in the season it is suitable for dessert.

Armored.—Dessert. December–April. A good keeper

of fine quality. Tree erect and free, with slender growth, compact on the Dwarfing stocks, slightly larger on the Free stocks. Fruit small, globular, richly aromatic, and retaining its characters very late.

Ashmead's Kernel.—Dessert. November–May. A late variety of high quality. Tree of moderate growth, forming a good bush on the Dwarfing stocks. Fruit small, round, yellowish with russet. Rich sweet flavour.

Baldwin.—Dessert and culinary. November–March. An American variety which only develops its best qualities in very favourable situations. Tree strong and free, forming a fine bush on the Paradise. Fruit medium to large, round or somewhat conical, yellow and deep-red, flavour when at its best rich, though acid.

Baumann's Red Winter Reinette.—Dessert and culinary. December–March. Tree erect in habit with strong branches, not very compact as a bush but prolific on the Paradise, also forms a good standard. Fruit medium, round or flattened, rich deep-red, firm, pleasant flavour when ripe, keeping its weight well and not shrivelling.

Baxter's Pearmain.—Dessert and culinary. November–March. A regular cropper of good constitution. Tree vigorous and open in habit, forms an excellent bush on the Paradise. Large trees can also be had on the Free stocks. Fruit medium, round or slightly conical, green and red, juicy, acid, but well-flavoured late in the season.

Beauty of Bath.—Dessert. July–August. Valuable as an early variety both in gardens and for market, distinct and prolific. Tree spreading, bushy, freely branched, but compact. Growth medium. Forms a fertile bush on the Paradise, and a large tree on the Crab or Free stocks. Fruit medium, round, yellow and red, flavour refreshing and good when newly gathered.

Beauty of Kent (fig. 874).—Culinary. November–January. Tree well branched, compact, and forming a good bush on the Dwarfing stock, or moderate-sized standards on the Crab, the latter preferable. Fruit large to very large, round, yellow, green and red, moderately acid, and well-flavoured, sometimes used for dessert late in the season.

Bedfordshire Foundling.—Culinary. November–February. A useful and free-bearing variety which both cooks and keeps well. Tree strong but irregular as a bush on the Paradise, very strong on the Crab either as a bush or small standard. Fruit large, round or angular, conical, moderately acid, becomes sweet later.

Belle de Boskoop.—Dessert. November–February. A useful late variety of good habit, free, very prolific as a bush or pyramid on the Paradise. Fruit large, globular, yellow with red streaks, of a brisk rich flavour, somewhat acid.

Belle de Pontoise.—Dessert and culinary. December–March. A fine late variety, keeping its weight and quality well. Tree erect with long shoots, free and vigorous on both stocks, but especially so on the Crab. Forms a good standard. Fruit large, round, yellow and red, moderately acid, with agreeable flavour as it matures.

Betty Geeson.—Culinary. January–May. A favourite variety in Worcestershire and neighbouring counties. An excellent keeper. Tree of moderate growth, forms a neat bush and is very prolific on the Paradise. Fruit medium to large, round and ribbed, green, changing to yellow and red.

Bismarck.—Culinary. October–February. Valuable for its free-cropping qualities and handsome appearance. Tree rather lax on the Paradise, but exceedingly prolific and produces fine fruits. As a standard or half-standard on the Crab it forms a vigorous handsome orchard tree, producing fruit early and heavily. Fruit medium to large, round or slightly conical, rich dark-crimson, moderately acid, pleasantly flavoured when fully ripe.

Blenheim (Orange) Pippin (fig. 875).—Dessert and culinary. November–February. Highly valued when productive, which it usually is on well-established trees. Excellent quality. Tree open and of vigorous growth, forming a shapely bush or large standard on the Free



Fig. 875.—Apple. Blenheim Orange. ($\frac{3}{4}$.)

stock, but slow in coming into bearing. Smaller trees on the Paradise are quicker, but they often do not grow freely. Fruit large, round, green and yellow, slightly acid, but richly flavoured at its best.

Blue Pearmain.—Dessert and culinary. November–

January. A handsome Apple of good quality, cropping well. Tree free in growth, forming on the Paradise useful bushes or pyramids. Fruit large, round or conical, purplish red, with a slight bloom, sweet and sometimes very rich.

Boston Russet.—Dessert. February–April. One of the latest keepers and of good quality. Tree of moderate growth on the Paradise stock as a bush. Fruit medium, round or conical, green with russet and slight red tint, excellent flavour.

Bowhill Pippin.—Dessert and culinary. October–February. A fine exhibition variety, the fruits of great size when well grown. Tree of moderate growth but free and healthy, succeeds on the Paradise as a bush, and also forms an excellent medium-sized standard. Fruit large

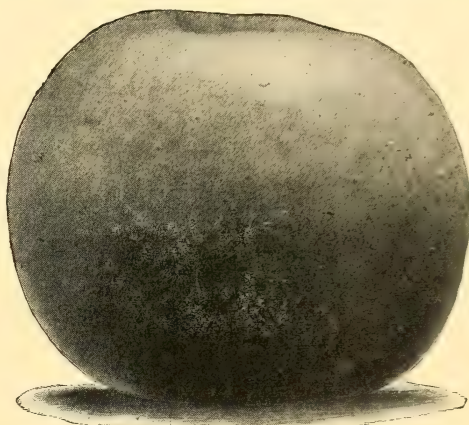


Fig. 876.—Apple. Bramley's Seedling. ($\frac{3}{4}$.)

to very large, globular, slightly coloured, rich flavour when fully ripe.

Brabant Bellefleur.—Culinary. November–March. A fine kitchen Apple, keeping well. Tree of moderate growth, but free and healthy, forming good bushes or pyramids on the Paradise, and very prolific where it succeeds. Fruit large, conical, ribbed, yellow or streaked, very handsome, brisk flavour.

Braddick's Nonpareil.—Dessert. October–December. Of high quality and a regular cropper. Tree upright, free, compact; forms excellent bushes on the Dwarfing stocks, and also succeeds on the Free. Fruit medium, round, green and russet with a slight red tint, richly flavoured and aromatic.

Bramley's Seedling (fig. 876).—Culinary. December–May. An excellent variety, cropping well on established trees, and keeping sound till late. Profitable for market. Tree vigorous on both stocks, branching widely; forms strong standards on the Crab, with stout stems and large heads. Fruit large to very large, round or slightly flattened, green, sometimes tinged with red, sharply acid at first, becomes softened with keeping.

Brownlee's Russet.—Dessert. November–March. Appreciated in gardens for the quality of the fruit and free-bearing. Tree irregular in habit, fairly strong, erect, suited on the Dwarfing stocks as a bush, thriving on Free stocks in some soils. Fruit medium, round, green and brown or reddish-russet, flavour rich when matured; can also be used for cooking early in the season.

Byford Wonder.—Culinary. January–March. A late-keeping heavy variety. Tree of open bush form on the Paradise; good standards can be grown on the Crab, and

are productive when established. Fruit large, round, green, acid and well-flavoured.

Calville Blanche d'Hiver.—Dessert and culinary. January–March. Handsome, rather tender in Great Britain, requires a warm situation or protection. Tree an excellent grower and forms strong bushes on the Paradise, for which it is best adapted, and under the best conditions is very prolific. Fruit large, round, with prominent ribs, pale greenish-yellow, flavour brisk and aromatic.

Calville Malingre.—Culinary. January–March. Not so tender as the other Calville's. Tree extremely strong in habit, and requires a vigorous Paradise stock, or preferably a Free stock, growing it in bush form. Fruit very large, rather oblong, and ribbed, yellow with a reddish tint, handsome.

Cambusnethan Pippin.—Dessert. October–January. A favourite Scotch variety which does well in the northern counties of England. Tree of moderate growth, forming a small bush on the Paradise stock and fairly productive. Fruit medium, somewhat flattened, yellowish with a few red streaks, slightly acid, but with a pleasant flavour.

Cardinal.—Dessert and culinary. August–September. A handsome prolific early variety. Tree erect and strong in habit, forming a well-proportioned bush on both stocks, very fertile on the Paradise. Fruit medium, round or slightly conical, of even and beautiful shape, yellow and bright-red, soft but pleasant flavour when freshly gathered.

Castle Major.—Culinary. October–November. Frequently grown in Kent and other home counties for market. Tree of moderate growth, forms a good bush on the best Paradise stocks. Fruit large, round or oblong and ribbed, acid, and aromatic.

Cellini. Dessert and culinary. August–November. A free-bearing and useful variety where it succeeds, but subject to canker in some soils. Tree of moderate growth, rather lax and irregular on the Paradise, but usually healthy longer on that stock though stronger trees are obtained in the early stages on the Free stocks. It can be grown as a short standard. Fruit medium, round or conical, even, striped with red, soft and pleasant flavour when fresh, but soon loses its quality.

Charles Ross (see Plate).—Dessert. September–December. A recent variety of much promise, handsome and good quality. Tree of free growth and can be worked on both Paradise and Crab stocks. Fruit medium to large, round, even, yellow, flushed and streaked with bright crimson, flavour rich and aromatic. Obtained from a cross between Cox's Orange Pippin and Peasgood's Nonesuch.

Chelmsford Wonder (fig. 877).—Culinary. January–April. A useful late variety of good quality. Tree often irregular in growth as a bush on the Paradise, but strong and well developed on the Free stock. Fruit medium, round or slightly flattened, green and yellowish, sharply acid, and good for cooking.

Christmas Pearmain.—Dessert. November–December. —A free cropper of good constitution. Tree bushy and upright, very strong and freely branched on Free stocks, also good on the Paradise. Fruit medium, round or conical, green, with bright-red and russet, of brisk pleasant flavour.

Claygate Pearmain.—Dessert. January–February. An excellent late Apple of first-class quality. Tree spreading, much branched, but bushy and strong, succeeds equally well on both classes of stocks, but is more fertile on the Paradise. Fruit medium, conical, green with reddish-russet, flavour remarkably rich and sweet.

Cobham.—Dessert and culinary. November–February. Handsome, of the Blenheim Pippin type, but earlier. Tree vigorous, adapted for the best Paradise or Free stocks as a large bush for early bearing, or as a standard for orchards. Fruit large, even, round or oval, yellowish-green with few crimson streaks, flavour sweet and rich when ripe.

Cockle's Pippin.—Dessert. January–March. An old variety of high quality, and keeps well. Tree erect, strong, and much branched, forming compact bushes on the Dwarfing stocks, but useful medium-sized standards; also good on the Crab. Fruit medium, somewhat conical, green and yellow, very rich and sweet at its best.

Cornish Aromatic.—Dessert. October–January. A high class Apple of fine quality. Tree of free growth but not strong, it does well on the Paradise or the Crab, and is fairly prolific. Fruit medium to large, round, yellow-russet and red, richly flavoured.

Cornish Gillyflower.—Dessert. January–May. One of the best, but a shy bearer. Tree of moderate growth, and can be had either on the Paradise or the Crab. Requires careful pruning as it bears near the points of the previous season's wood. Fruit medium, rather angular and irregular, dull-green and reddish, flavour rich aromatic, and sweet.

Court of Wick.—Dessert. October to March. A small Apple of high merit. Tree of moderate growth and good constitution, succeeding well on the Paradise as a bush or pyramid. Fruit small, round, yellow and russet, with a rich aromatic flavour.

Court-Pendish-Plat.—Dessert. February–April. A useful late variety, keeping very soundly. Forms a dwarf bush of slender growth on both kinds of stocks; difficult to obtain in a vigorous condition. Fruit medium, round

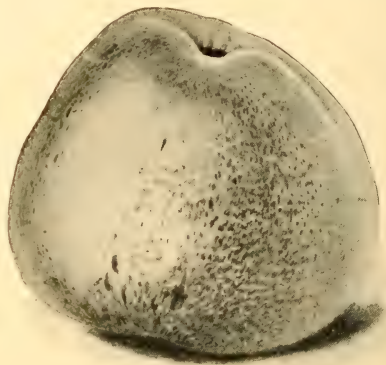


Fig. 877.—Apple. Chelmsford Wonder. (4.)

but much flattened, very distinct, green, yellow, and deep-red, firm, and pleasant flavour late in the season.

Cox's Orange Pippin (fig. 878).—Dessert. November–February. One of the best. Tree free and vigorous with slender wood and much "spray", very fertile on good Paradise stocks; especially adapted for the open-bush style of growth; also strong on Free stocks as a bush or standard, bears freely at an early age. Fruit medium, round, inclined to conical, yellow and bright-red, juicy, richly flavoured, and retains its qualities, if carefully kept, until it shrivels.

Cox's Pomona (fig. 879).—Dessert and culinary. October–November. A handsome and free-cropping variety. Tree forms a dense full bush freely branched and strong, requires to be well pruned in the centre. Good as a

standard. Fruit large, round or conical and angular, yellow and brilliant-red, very beautiful, flavour brisk and pleasant when fresh.

D'Arcy Spice.—Dessert. February–March. Of exceptional quality but difficult to obtain at its best. Tree



Fig. 878.—Apple. Cox's Orange Pippin. (4.)

erect but making very little growth on any stock. It requires the best cultivation on good soil to be satisfactory. Fruit medium, round or slightly flattened, green or yellowish-red, flavour rich and aromatic.

Devonshire Quarrenden.—Dessert. August. A favourite and useful early Apple, in considerable demand. Tree inclined to be lax in habit, moderately branched, especially free on the Crab; also fertile on the Paradise. Not satisfactory in a cold soil. Fruit small to medium, round but flattened, uniform dark-red, juicy, refreshing, and one of the most aromatic of early Apples.

Domino.—Culinary. August–September. A prolific hardy variety which succeeds in cold midland and northern districts. Tree of moderate growth as a bush, stronger on the Crab and making a compact standard with stout stem and good head. Fruit medium to large, conical and somewhat angular, green and yellow, soft and slightly acid.

Duchess's Favourite.—Dessert. September–December. A useful market Apple owing to its brilliant colour, very prolific on good stocks. Tree erect, of medium growth



Fig. 879.—Apple. Cox's Pomona. (4.)

on the Paradise, stronger on the Free stocks, forms a good head quickly when grown as a standard. Fruit small, round, brilliant-scarlet, sweet and pleasantly flavoured.

Duchess of Oldenburg.—Culinary. August–September. Handsome and free, of fine constitution. Tree strong and erect with long shoots. Forms a prolific bush on the Paradise, is also suited for Free stocks when large trees are desired. Fruit medium to large, round and somewhat ribbed, green, yellow, and rich crimson, moderately acid, and pleasantly flavoured when fresh, but soon loses its quality. When at its best it may be used for dessert.

Duke of Devonshire.—Dessert. March–May. Chiefly valued for its late keeping character. Tree very strong, free, open, much branched, excellent on Free stocks and good as a standard. On the Paradise stock it is rather small but very prolific. Fruit medium, round, aromatic and sweet.

Dumelow's Seedling (fig. 880).—Culinary. November–March. A favourite acid Apple for cooking. Tree of vigorous growth on the Crab either as a bush or standard.



Fig. 880.—Apple. Dumelow's Seedling.

More compact on the Paradise, but more liable to disease. Requires a well-drained soil to ensure the best results. Fruit medium to large, round and slightly flattened, yellowish with a bright soft-red tint, sharply acid but pleasantly flavoured.

Dutch Mignonne.—Dessert and culinary. December–March. An old favourite, an excellent keeper; prolific and hardy. Tree strong, branching freely but compact and bushy. Does well both on the Paradise and the Crab. Fruit medium, round, yellowish with red and russet markings; flavour rich and sweet.

Early Harvest.—Dessert and culinary. August. Of American origin, but long grown in Great Britain. Tree of moderate growth, and best suited for the Paradise as a bush or pyramid, when it is very prolific. Fruit medium, round, greenish-yellow to yellow, juicy and brisk flavour.

Early Julian.—Culinary. August–September. Of

considerable merit for gardens, being useful and early. Tree dwarf, compact, does well and makes moderate growth on the Paradise. Fruit medium, round, somewhat ribbed, flavour pleasantly acid, slightly aromatic.

Early Nonpareil.—Dessert. October–December. A useful and hardy variety. Tree of moderate growth, thriving as a bush on the Paradise, and bearing freely. Fruit small, flattened, yellow and russet, rich aromatic flavour.

Early Peach.—Dessert. August. Raised from Irish Peach which it surpasses in habit and bearing qualities. Tree erect, growth vigorous, well branched and compact. It thrives on both classes of stocks, but develops into a fine tree on the Free stock. Fruit medium, yellowish and red, juicy, rich, and excellent.

Early Rivers.—Culinary. July–August. An early, prolific, and hardy variety superior to many of the same season. Tree strong, tall, and bushy, much branched. Succeeds on both stocks, but crops best on the Paradise. Fruit medium, round or slightly conical, yellow, juicy, and pleasantly acid.

Early Victoria.—Culinary. August–September. A cross between Lord Grosvenor and Keswick Codlin. It has been grown with success at Wisbech. Tree of free growth, prolific on the Paradise as a bush, and can be grown as a standard on the Crab. Fruit of medium size, round or slightly conical, yellow, of brisk flavour.

Ecklinville.—Culinary. September–November. Of large Codlin type, useful and prolific where it thrives, but it fails in some places. Tree vigorous but irregular as a bush, rather better as a pyramid. It forms a large spreading standard on the Free stock. Fruit large to very large, round, flattened, green and yellow with slight red tint, soft and moderately acid.

Eyremonet Russet.—Dessert. October–November. An excellent autumn Apple of high quality. Tree erect, compact, of moderate growth, but freely branched; slow in development on the Paradise, but fruitful. Fruit medium, round, yellow with bright russet, flavour rich and aromatic.

Emperor Alexander.—Culinary. September–December. An exhibition variety, of fine appearance. Tree very strong on the Free stock, but it comes into bearing earlier and is more prolific on a strong Paradise stock. Fruit large to very large, oval and even, yellow streaked, red and orange, juicy and sweet when fully ripe.

Earn's Pippin.—Dessert. January–March. A useful late variety of good quality. Tree forming an open vigorous bush, freely branched; very prolific on Dwarfing stocks; may be planted rather closely. Fruit small to medium, yellow and red with some russet, flavour brisk and refreshing, becoming sweet with keeping.

Flanders Pippin.—Culinary. December–February. Grown in some of the western counties with much success. Tree of free growth, forming a compact useful bush on the Paradise; very strong on the Crab, and develops into a fine standard and an excellent orchard tree. Fruit medium to large, round and flattened, yellowish, slight red tint, juicy and moderately acid.

Frogmore Prolific.—Culinary. August–September. An excellent cooking Apple of fine quality. Tree rather straggling in habit, of moderate growth on both classes of stocks, but rather more compact on the Paradise. Fruit large, round, yellow with red tint, juicy and pleasant flavour.

Gascogne's Scarlet Seedling (fig. 881).—Dessert and culinary. November–February. Handsome and useful for garden or market. Tree of vigorous open habit with long

Willow-like growths; forms a fine bush on the Paradise and an excellent standard on the Crab. Very prolific and a regular cropper. Fruit large, round or somewhat conical and slightly angular or ribbed, resembling Cox's Pomona,

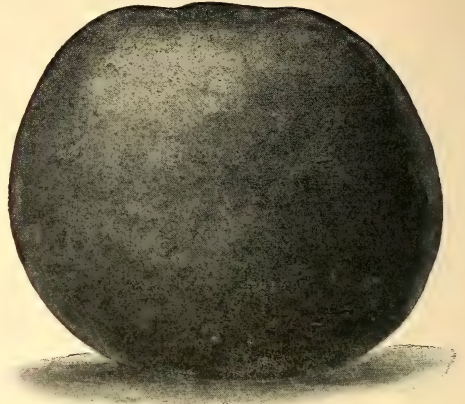


Fig. 881.—Apple. Gascogne's Scarlet Seedling. (½.)

yellowish-green and brilliant-red, moderately acid with a distinct pleasant flavour.

Gloria Mundi.—Culinary. December–January. Tree erect and tall, almost fastigiate, with clean vigorous growth. Does best on the Paradise, but is not a prolific variety. Fruit very large, one of the largest, round and angular, yellowish with a little red occasionally, juicy and moderately acid.

Gold Medal.—Culinary. September–October. A hardy and prolific variety of good constitution which thrives in the north of England and in cold districts generally. Tree dwarf, compact, good as a bush on the Paradise; also does well on the Free stock. Fruit large, round or somewhat conical and angular, moderately acid.

Golden Harvey.—Dessert. December–May. An excellent table Apple. Tree of moderate growth but healthy and forms an excellent small tree on the Paradise stock, bearing freely. Fruit small, round, flattened, yellow and russet, flavour exceptionally rich.

Golden Noble (fig. 882).—Culinary. October–December. A handsome and useful variety especially for gardens.



Fig. 882.—Apple. Golden Noble. (½.)

Tree of strong free growth, forming a good bush on the Dwarfing stock, but develops into a handsome standard with large, well-balanced heads, and stout stems on the

Free stock. Fruit large, round and even, yellow, firm and moderately acid with a pleasant flavour.

Golden Pippin.—Dessert. November–April. An old but still valued Apple when true to character. Tree of moderate growth, well suited for the Dwarfing stocks, on which it bears freely, and in good soils and situations continues healthy and productive. Fruit small, round, slightly flattened or elongated, yellow with few russet spots, flavour rich and sweet.

Golden Reinette.—Dessert. November–February. An old variety of excellent quality. Tree strong, and succeeds either on the Paradise or Free stocks, but is generally more satisfactory on the former if a good type is used. Fruit medium, round and even, bright-yellow with red streaks, flavour rich and brisk.

Golden Spire.—Dessert and culinary. October–December. A prolific and regular cropper, good for orchards or gardens. Tree compact and erect, with long growths of moderate strength. It forms a well-shaped bush on either Dwarfing or Free stocks, and also makes a good standard, the stem being very strong. Fruit medium to large, conical, much elongated and distinct, deep-yellow, firm and moderately acid with a pleasant flavour.

Gospatrie.—Culinary. October–December. Of good quality, and can be used for dessert. Tree of moderate growth on the Paradise, but free and compact on the Crab, forming a useful medium-sized standard. Fruit medium, conical, slightly angular, yellowish, with a pleasantly-flavoured acidity.

Grange's Pearmain.—Dessert and culinary. January–March. A prolific, hardy variety, especially useful for cooking purposes. Tree forms an open, much-branched bush on both classes of stocks. Fruit large, conical, yellow and green with red and russet, flavour rich and refreshing as it matures.

Gravenstein.—Dessert and culinary. October–December. A variety of high quality, but rather uncertain in cropping; a favourite in Germany. Tree of strong growth and spreading habit, forming a large open bush. Good on either stock, but most fertile on the Paradise. Fruit medium to large, round and angular, yellow with red spots, juice abundant, of a peculiarly distinct and aromatic flavour.

Greenup's Pippin.—Dessert and culinary. October–December. A favourite in the north of England. Tree of moderate growth, free and hardy, grows and bears well on the Paradise. Fruit medium to large, round, pale-yellow with red tint, very juicy and sweet when ripe.

Grenadier.—Culinary. September–October. Prolific and useful for garden or market; is sometimes confused with other varieties. Tree of moderate growth, erect, and compact as a bush on the Paradise; forms a healthy standard on the Crab. Fruit large, round, angular and ribbed, deep-yellow, acid and well-flavoured.

Hambledon Deux Ans.—Culinary. An old variety much grown in some parts of Hampshire. Tree strong and free, does well on the Crab as a standard, but good early-bearing bushes are obtained on the Paradise. Fruit large, round, yellowish with red tint, very juicy and brisk; when well ripened sweet and suitable for table use.

Hambling's Seedling (fig. 883).—Culinary. December–March. Hardy and free, a good late keeper. Tree of moderate, compact growth on the Paradise, stronger on the Crab; forms a good standard. Fruit large, round, green, juicy and slightly acid.

Hanwell Souring.—Culinary. December–March. A late-keeping variety, retaining a powerful acidity. Tree of free growth, adapted to both classes of stocks. Fruit

medium to large, yellowish with a red tint, brisk acid juice.

Harvey's Wiltshire Defiance.—Dessert and culinary. October–December. Handsome and useful, a favourite in some southern counties. Tree of free growth, adapted both for the Paradise and Free stocks. Fruit very large, round or conical, slightly angular, yellow with russet, finely flavoured.

Hawthornden.—Culinary. October–December. A favourite and useful Apple of first-class quality. Tree of moderate growth, rather irregular, except when on the Free stock. Fruit medium to large, round, green or yellow with red tint, slightly acid, of fine flavour; excellent for cooking.

Herefordshire Beefing.—Culinary. November–January. A valuable cooking Apple, very heavy, and acid. Tree of free growth, adapted for both Dwarfing and Free stocks. Fruit small to medium, round and flattened, dark-red, very juicy.

Herefordshire Pearmain.—Dessert and culinary. November–December. An old variety, still valued for kitchen purposes especially, hardy and prolific. Tree rather irregular if not carefully pruned; grows freely on both stocks. Fruit large, conical, greenish-yellow with a little red, flavour aromatic, slightly acid juice.

Hollandbury.—Culinary. October–December. A handsome and good constitutional variety, but apt to be rather "shy", bearing where it grows strongly. Tree forms a large spreading bush on a Free stock, smaller but serviceable on a Dwarfing stock; it also makes a fine standard for orchards. Fruit large to very large, round, angular, yellowish-green with brilliant-red, moderately acid and slightly aromatic.

Hornead Pearmain.—Dessert and culinary. December–April. Hardy and fairly prolific, keeps extremely well. Tree erect, compact, free, vigorous and clean in growth. Good on both stocks, forms a good bush and a well-developed standard. Fruit medium to large, round, yellow and russety, acid and well-flavoured.

Hubbard's Pearmain.—Dessert. November–April. An excellent variety of good constitution and high quality. Tree of moderate growth, does well on the Paradise stock.

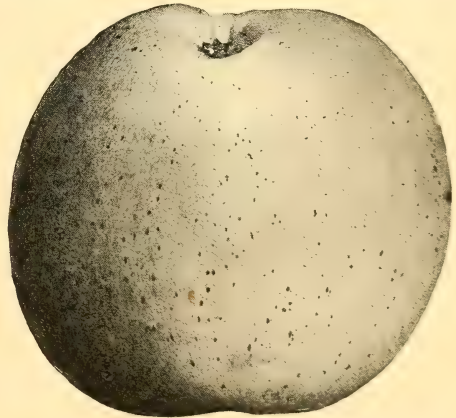


Fig. 883.—Apple. Hambling's Seedling. (4.)

Fruit small, oval or rounded, yellowish covered with russet, richly flavoured.

Irish Peach (fig. 884).—Dessert. August. An old favourite, but now closely rivalled by Early Peach and Lady Sudeley. Tree open, moderately branched; is best on the Paradise, but can be grown into fine bushes on a

Free stock. Careful pruning is needed, as it fruits chiefly at the points of the branches. Fruit small to medium, round, yellow and red, richly flavoured.



Fig. 884.—Apple. Irish Peach. (½.)

Keddleston Pippin.—Dessert. December–March. Of high quality, small but useful. Tree of moderate growth, best on the Paradise stock as a pyramid. Fruit small, round, golden-yellow with russet, flavour rich and sweet.

Kerry Pippin.—Dessert. September–October. An old Irish Apple of much merit, hardy and prolific, but sometimes discarded on account of its small size. Tree erect, compact, of medium growth. Where it does not thrive on the Paradise, a Free stock generally produces better results. Fruit small, round or ovoid, yellow and bright-red, richly aromatic when fully ripe.

Keswick Codlin.—Culinary. August–September. Prolific and excellent for cooking, but rather small as compared with other Apples of the season. An “improved” variety is grown in some nurseries. Tree erect, of medium growth, very prolific on a Dwarfing stock, stronger in growth on the Crab. Fruit medium, conical, ribbed, deep-yellow, moderately acid but well-flavoured.

King of the Pippins.—Dessert. October–January. A handsome and prolific variety, a favourite for exhibitions, it is most satisfactory in warm soils and districts. Tree somewhat spreading, freely branching, of medium strength; succeeds on the Paradise as a bush and on the Crab as a small standard; comes into bearing early, and is usually very prolific. Fruit medium, conical, even, golden-yellow and bright-red, very beautiful, briskly and pleasantly flavoured when fresh, but becomes dry and insipid when kept long.

King of Tompkins' County.—Dessert or culinary. December–February. An American Apple which has become a favourite in this country both for use and exhibition. Tree of free growth, does well on the Paradise or Free stocks. Fruit large, round, slightly flattened, deep-yellow streaked with red, flavour sweet and rich when well-ripened.

Lady Henniker.—Culinary. December–January. A hardy and usually prolific variety, which often succeeds where other varieties have failed. Tree of lax and irregular growth on the Paradise, but stronger and forms good standards on the Crab. Fruit large to very large, round and slightly conical or angular, yellow streaked with bright rich-red, slightly aromatic and brisk in flavour, essentially a cooking variety.

Lady Sudeley.—Dessert. August–September. Handsome, very hardy, and prolific. Tree erect and compact, of medium growth; does on both classes of stocks either as a bush or standard. Where large bush trees are re-

quired they should be grown on Free stocks. Fruit medium to large, round, even, yellow striped with crimson, soft, richly flavoured, aromatic, and sweet. It should be gathered direct from the tree for use, as it loses its best qualities rapidly when kept for a few days.

Lamb Abbey Pearmain.—Dessert. January–April. A long-keeping, useful Apple, of high quality when at its best. It is said to have been raised from seed of Newtown Pippin. Tree of moderate but healthy growth, well suited for the bush form on Paradise stocks. Fruit small, round, yellowish-green with red streaks, juicy and richly flavoured.

Landsberger Reinette.—Dessert and culinary. October–December. Prolific and useful, and of good constitution. Tree of vigorous growth, much branched and shapely on both stocks, very strong on the Free stock. Fruit medium to large, conical, slightly angular, yellow and red, juice sugary and perfumed.

Lane's Prince Albert (fig. 885).—Dessert and culinary. November–March. Valuable for garden or market, coming into bearing early, and cropping regularly. Tree rather lax and spreading, fertile and healthy on either stock. In the bush form on the Paradise it bears early and continually. For a large bush the Free stock is best; grown as a standard the stems require staking, but in sheltered places it succeeds well in that form. Fruit large,



Fig. 885.—Apple. Lane's Prince Albert. (½.)

round, even, green or pale-yellow with slight red tint, briskly acid and refreshing, pleasant flavour.

Langley Pippin (fig. 886).—Dessert. September. An early new variety of much promise, obtained from a cross between Cox's Orange Pippin and Mr. Gladstone. Tree of moderate growth, but free, healthy, and prolific. Fruit of medium size, conical, yellow streaked and flushed with bright-red, flavour slightly aromatic, refreshing, and juicy.

Lewis's Incomparable.—Dessert and culinary. December–February. Valuable as a hardy and prolific variety. Tree forms an open bush of moderate growth, does well on either the Paradise or Crab, but is best on the former in gardens. Fruit large, round or conical, yellow streaked bright-red, slightly acid and of fair flavour.

Loddington.—Culinary. August–December. Prolific and hardy, much grown for market in the home counties. Tree strong, spreading, tall, but compact; free and good on the Crab as a standard; also useful on the Paradise, bearing early and freely. Fruit large to very large, round,

green, or yellow with red tint, moderately acid, abundant juice.

Lord Derby.—Culinary. November–December. Valuable both for garden and market. Tree erect, much branched but compact, healthy and free on both stocks;

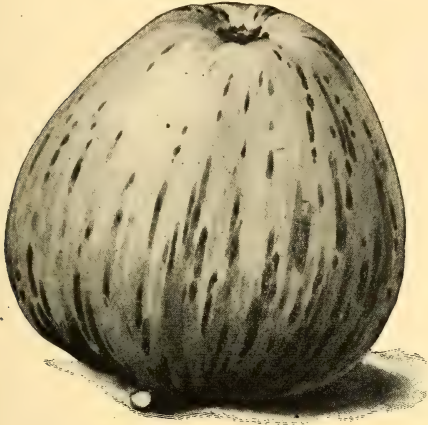


Fig. 886.—Apple. Langley Pippin. (½.)

grown as a standard on the Free stock it is a regular cropper. Fruit large to very large, round, ribbed, bright-green, acid and pleasantly flavoured.

Lord Grosvenor.—Culinary. August–September. Of strong constitution, useful, a free cropper, and early. Tree vigorous and erect, forming a shapely bush on a Dwarfing stock; very prolific as a standard on the Crab. Fruit medium to large, conical, deep-yellow, soft, juicy, and moderately acid. Not so readily damaged as some other early varieties of this type.

Lord Hindlip (fig. 887).—Dessert. January–May. A handsome late-keeping Apple of recent introduction, and very promising. Tree of moderate growth, somewhat

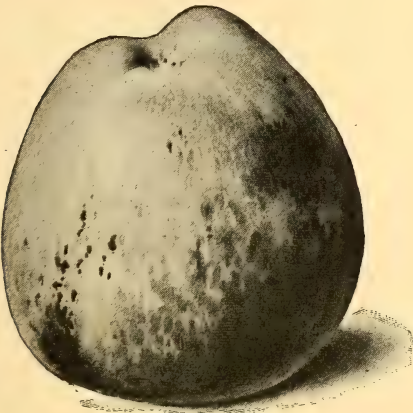


Fig. 887.—Apple. Lord Hindlip. (½.)

pendulous in habit, succeeds well as a bush on the Dwarfing stocks. Fruit medium to large, conical, slightly ribbed, yellow with scarlet and crimson, richly flavoured when thoroughly ripened.

Lord Suffield.—Culinary. August–September. Prolific and handsome, but subject to attacks of canker in cold soils; the fruit also is easily bruised. Growth irregular, of moderate strength on the Paradise, stronger but less

prolific as a small tree on the Crab. Fruit large, somewhat conical, even and handsome, deep-yellow, soft, briskly acid, and well-flavoured.

Mabbott's Pearmain.—Dessert. October–December. A prolific variety of high quality; excellent for the garden. Tree erect and free, the growth slender, best on the Paradise as a bush, but it can also be grown satisfactorily on a Free stock. Fruit medium, round, yellow slightly tinted with red, richly flavoured and aromatic.

Maltster.—Culinary. October–December. Prolific and hardy, a favourite in Nottinghamshire. Tree lax and of moderate growth, forming an open bush; can be grown on either stock, but preferably on the Paradise. It also forms a good standard. Fruit medium to large, round and slightly flattened, yellowish-green streaked with bright-red, briskly acid when fresh, and well-adapted for cooking. It is sometimes used for dessert when matured.

Manks Codlin.—Culinary. September–October. Hardy, prolific, and excellent for kitchen purposes. Tree dwarf and of moderate, slender growth on either stock, but is extremely prolific on the Paradise. Fruit medium, conical, and slightly ribbed, yellow, slightly acid, juicy and pleasantly flavoured.

Mannington's Pearmain.—Dessert. November–December. Hardy and prolific, a variety of high quality, valuable in gardens. Tree dwarf, of lax and slender growth; fairly good on either stock; is not satisfactory in wet, cold situations. Fruit medium, conical, deep-yellow with russet-red, excellent flavour, brisk and aromatic.

Margaret.—Dessert. August. Early and of good flavour, fairly prolific. Tree erect, of medium strength, not much branched, suitable for bush or pyramid, rather slow but very fertile on the Paradise. Large bushes and standards are best on the Crab. Requires careful pruning to secure a well-balanced tree. Fruit small to medium, round, yellow with abundant bright-red, flavour brisk and rich for an early Apple.

Margil.—Dessert. October–January. Hardy and of the first quality, but the flowers are tender and easily injured by slight frost. Tree dwarf, of compact, slender growth; on the Paradise it fruits early and freely. Vigorous trees can be grown on a Free stock. Fruit small, conical, deep-yellow and bright-red, juicy and richly aromatic.

Melon Apple.—Dessert. November–December. Of American origin, but has proved successful in this country. Tree of moderate growth, forming a good bush on the Dwarfing stocks. Fruit medium to large, round, yellow streaked red, flavour sweet and pleasant.

Mère de Ménage.—Culinary. December–January. Useful and handsome for general cultivation, a favourite for exhibition. Tree very strong, free, and open, with stout branches; does well as a large bush or standard on the Crab, which is more adapted to its habit than the Paradise. Fruit large to very large, round, somewhat flattened, or slightly conical and ribbed, remarkable for its dark-red colour, briskly acid and well flavoured.

Minchull Crab.—Culinary. November–March. A variety much grown in Lancashire and Cheshire. Tree of free growth, but forms a compact bush on the Paradise. Fruit large, round, green and yellow, with russet and red streaks, flavour acid and distinct.

Mr. Gladstone.—Dessert. July–August. Useful, early, and of fair quality. Tree of rather lax free habit, not much branched, with medium to strong wood. It succeeds on both classes of stocks, but in most soils a Free stock is best; it also does well as a short standard. Fruit of medium size, round, yellow with red streaks,

flavour brisk and refreshing when gathered for immediate use.

Mrs. Phillimore.—Dessert. November–December. A recent variety of fine appearance, raised from a cross between Cox's Pomona and Mr. Gladstone; likely to be a favourite. Tree prolific, of steady growth, and suitable both for bush and standard form. Fruit large, round or



Fig. 888.—Apple. Newton Wonder. (½.)

slightly conical, ribbed, green or yellow with red, soft and excellent aromatic flavour.

New Hawthornden.—Culinary. November–December. Hardy and prolific, useful both for garden and market culture. Tree compact, freely branched as a bush on the Paradise, stronger on the Crab; comes into bearing rather slowly. Fruit large, round, flattened, pale-green or yellow, juice abundant and briskly acid.

New Northern Greening.—Culinary. November–April. An excellent late Apple of hardy constitution, good for gardens or market. Tree very strong, erect, much branched; forms a good bush on a Dwarfing stock, but is best on the Crab as a standard. Fruit large to very large, round, even and handsome, green with rich red colour, pleasantly acid, and very heavy.

Newton Wonder (fig. 888).—Culinary. November–May. A useful late variety, of excellent constitution. Tree of vigorous growth as a large bush or standard on the Crab; satisfactory as a bush on a Dwarfing stock. Fruit large to very large, round, even, yellow and crimson when ripe, firm with a brisk acidity and good flavour.

Newtown Pippin.—Dessert. December–April. A celebrated old American Apple, but is rarely obtained at its best in this country even with protection. Tree of slender moderate growth, forming a small bush on the Paradise. Fruit medium, even, round, green, very juicy with a brisk rich flavour.

Nonesuch.—Culinary. September–October. An old variety, still a favourite in some districts. Tree of lax, much branched, and slender growth; forms a good bush on the Paradise, and a well-developed tree on the Crab. Fruit medium, round and even, yellow streaked with red, sweet and well flavoured.

Nonpareil.—Dessert. January–May. An old and valuable Apple of first-rate quality. Tree of moderate growth, but free and hardy, forming a compact bush on the Paradise, bearing freely in the best situations. Fruit small, round, yellowish with russet and red, flavour aromatic.

Norfolk Beefing.—Culinary. January–May. A late keeper, very healthy and hardy in the best situations,

subject to canker in wet soils. Tree of moderate growth, forming a useful open bush on a Dwarfing stock. Fruit medium to large, round and flattened, green, yellow, and abundant dark-red, acid and firm, well flavoured.

Northern Dumpling.—Culinary. September–October. An especially hardy variety, which succeeds in some of the coldest northern districts. Tree freely branched, compact, and of good habit; fairly prolific and hardy as a bush on a Dwarfing stock; also makes an excellent standard. Fruit large, round or somewhat conical, greenish-yellow and red, briskly acid.

Okera.—Dessert. September. Of Continental origin, peculiar in colour and flavour. Tree erect, strong and irregular in growth, needs close attention to secure a well-formed specimen. It will thrive on either kind of stock. Fruit of medium size, distinct dull reddish-yellow tint, flavour aromatic and rich when well ripened.

Peasgood's Nonesuch (fig. 889).—Culinary. November–December. A fine exhibition variety, chiefly valued for its great size, but the quality is also good. Tree spreading, dwarf and open as a bush on the Paradise; strong standards can also be had on the Crab. Fruit large to very large, round or somewhat flattened, even, yellow with abundant red streaks, very handsome, acid and juicy.

Potts' Seedling.—Culinary. August–October. A free cropper of considerable merit for gardens or market. Tree forms an excellent bush or pyramid of medium growth on the Paradise, and is healthy and free and extremely prolific; also forms a good standard with well-developed heads and a stout stem. Fruit medium to large, round or slightly conical, green, becoming yellow when ripe. Excellent for cooking.

Red Astrachan.—Dessert. August–September. Chiefly useful for its prolific vigorous habit and hardiness. Good for market purposes. Tree strong, erect, much branched, forming a bush quickly on a good stock. On the Paradise it is much smaller, but bears earlier. Fruit medium,



Fig. 889.—Peasgood's Nonesuch. (½.)

yellow and abundant rich red, very sweet and of good flavour. Must be used immediately after gathering.

Reinette de Canada.—Dessert and culinary. November–March. Hardy, prolific, and useful for gardens or market. Tree of strong free open growth; succeeds on both classes of stocks, but is more prolific on the Paradise. Fruit large, rather conical, yellow with a little russet, finely flavoured and juicy.

Rhode Island Greening.—Dessert and culinary, November–April. Of American origin, but it thrives satisfactorily in Great Britain. Tree of strong growth and well fitted for the Free stocks, but useful trees can also be had on the Paradise. Fruit large, round, green, flavour very rich when at its best.

Ribston Pippin.—Dessert. December. An excellent old variety of the highest quality, but much subject to canker and often worthless in wet cold soils. Growth lax and spreading on the Paradise, but much more prolific and healthy as a bush on this stock than on the Crab, though larger and better developed trees can be usually obtained on the latter. Fruit medium, round, rather angular, yellowish-green and dark-red, especially rich and sweet, a distinct flavour.

Rosemary Russet.—Dessert and culinary. December–February. A high-class variety of great merit. Tree erect, growth vigorous, forming a healthy bush, pyramid or standard, as it is suited to both kinds of stock. Fruit medium, ovoid or round, yellow-green and russet-red, excellent flavour, very aromatic.

Ross Nonpareil.—Dessert. November–January. Valued for its high quality. Tree compact, bushy, freely branched, growth slender; excellent on the Crab as a large bush or small standard; also satisfactory as a bush or pyramid on the Paradise. Fruit small to medium, round, reddish-russet, firm, rich, and sweet.

Roundway Magnum Bonum.—Dessert. November–February. Of great excellence where it succeeds. Tree of spreading strong growth, small but compact on a Dwarfing stock. In strong soils it often makes too much growth to be fertile, requiring to be lifted or root-pruned. Fruit large, ovoid, somewhat ribbed, yellow and red streaks, flavour remarkably rich and distinct; it has been considered by some as the best dessert Apple of its season.

Round Winter Nonesuch.—Culinary. November–March. Useful for garden and market culture. Tree of free growth, good on Crab or Paradise. Fruit large, round, flattened, green, streaked crimson, juicy and finely flavoured when ripe.

Royal Jubilee (Graham's).—Culinary. October–February. A regular cropper, good for gardens and market. Tree of moderate growth, forming an open dwarf bush on the Paradise; also thrives on a Free stock as a standard of moderate size. Fruit large, conical, even, handsome, deep-yellow, briskly acid with a good flavour; sometimes used late in the season for table, but it is rather large for this purpose.

Royal Late Cooking (fig. 890).—Culinary. December–April. A hardy, healthy, prolific variety. Tree vigorous, and forms a fine bush or pyramid on a Dwarfing stock. Fruit medium, round, even, yellow, slightly acid, well flavoured.

Royal Russet.—Culinary. November–May. Of the best quality as a kitchen Apple, keeping sound very late. Tree strong, and does well on a Free stock, but is more useful in gardens on the Paradise. Fruit large, round, yellowish with abundant russet, juicy and very sweet when ripe late in season.

Rymer.—Culinary. October–December. Of hardy constitution. Tree of moderate growth, forming a good bush on a Dwarfing stock. Fruit large, round, ribbed, and slightly flattened, streaked red, juicy and brisk.

Scarlet Pearmain.—Dessert. October–January. A pretty little Apple, hardy and prolific, of fair quality. Tree dwarf, erect, compact, of slender growth; does well on the Paradise, though it can be grown satisfactorily on

the Crab. Fruit small to medium, conical, even, yellowish streaked with deep-red, sweet and pleasantly flavoured.

Schoolmaster.—Culinary. October–December. Hardy and prolific, does well in the Midland counties. Tree dwarf, compact, and of moderate growth on the Paradise; freer as a bush or small standard on the Crab. Fruit large, round, slightly angular, green or yellow, tinted red, juicy and moderately acid, well flavoured.

Seaton House.—Culinary. October–December. A prolific, hardy, and useful variety for small gardens. Tree of moderate growth, forming a small bush on the Paradise. Fruit medium, round, yellow and red, brisk pleasant flavour.

September Beauty.—Dessert. October–November. Tree compact and well branched. Growth slender, forming a good bush on a Dwarfing stock, and fine trees on a Free stock, though slower in coming into bearing. Fruit small, round or slightly conical, yellow and red, richly flavoured when ripe.

Stirling Castle.—Culinary. October–December. Useful for gardens or market, being hardy and a good cropper. Tree of moderate and rather slender growth as a bush or pyramid either on the Paradise or Crab; frequently does not make sufficient growth to keep a good form. Requires liberal treatment; is rather subject to scab in cold wet districts. Fruit large, round and even, slightly flattened, yellow sometimes with a red tint, juicy and briskly acid early in season.

Striped Beefing.—Culinary. October–May. A beautiful and useful variety, prolific when well established. Tree vigorous, especially on the Free stock, on which it



Fig. 890.—Apple. Royal Late Cooking. (½.)

forms large standards. Bush trees need lifting or root-pruning when they make excessive growth. Fruit large to very large, round, green streaked with rich crimson, acid and of good flavour.

Sturmer Pippin.—Dessert. February–June. Excellent, late, and of high quality. Tree of moderate growth; as a bush on the Paradise it is dwarf, and somewhat lax, but very prolific in favourable situations; it also forms a compact and fertile standard on the Crab. Fruit small to medium, round, yellowish with red and russet, flavour remarkably rich and distinct when at its best.

Sugar-Loaf Pippin.—Culinary. August. Very early and of good quality fresh from the tree. Tree spreading, much branched, and strong. Well adapted for the bush form, especially on a Free stock; is rather weak on the Paradise on some soils. Fruit medium to large, conical, yellow, acid and juicy.

The Queen (fig. 891).—Dessert and culinary. October–January. Handsome for exhibition, prolific, and of good quality. Tree of free growth on the Crab and forms a handsome standard; it can also be grown on a Dwarfing stock, and takes a pyramidal shape naturally. Fruit



Fig. 891.—Apple. The Queen. (3.)

large, round, even, flattened, yellow streaked red, acid, and of good flavour.

The Sandringham.—Dessert and culinary. November–January. A fine exhibition variety, hardy and prolific. Tree of excellent habit, erect, freely branched, compact as a bush on a Dwarfing stock; also thriving on the Crab. Fruit large, conical, green or yellowish, tinted red, moderately acid, and of good flavour.

Tom Putt.—Culinary or cider. A favourite Apple in the west of England, where it crops freely. Tree vigorous and erect, much branched and compact as a bush on Dwarfing stocks; very strong as a bush or standard on the Crab. Fruit medium to large, round, or somewhat flattened, even, yellowish regularly streaked with dark-red, juicy, sweet, and of fair flavour.

Tower of Glammis.—Culinary. November–February. Hardy and prolific, a favourite in Scotland. Tree rather lax in habit, tall, with strong straggling growths if not well pruned. Fruit large, conical and angular, yellow, acid and well flavoured.

Twenty Ounce.—Culinary. November–December. Of American origin, may be used for dessert when well ripened. Tree an excellent grower, erect, vigorous, with long clean shoots; useful as a bush on the Paradise. Fruit medium to large, round, even, green, soft, and briskly flavoured.

Tyler's Kernel.—Culinary. October–December. A fine exhibition variety, also of good quality for garden use. Tree free, vigorous, and erect, good on either stock. Fruit very large, conical and angular, deep-red, slightly acid.

Vicar of Beighton.—Culinary. April–May. A late keeper, a favourite in Norfolk. Tree of spreading bushy habit and moderate growth on the Paradise stock, for which it seems well suited. Fruit medium, round, yellowish and rich-red, briskly acid.

Wadhurst Pippin.—Culinary. October–January. A fine Apple for general use where it succeeds. Tree of moderate growth, rather lax and irregular as a bush unless carefully pruned; healthy and fertile on the Paradise, stronger on the Crab. Fruit large to very large, conical, green with red streaks, flavour rich and aromatic.

Warner's King (fig. 892).—Culinary. November–December. Hardy, prolific, and healthy; valuable for garden or market. Tree erect, vigorous; does well on the Free stock either as a large bush or standard. Fruit large to very large, round, slightly angular, green or yellow, acid and well flavoured.

Washington.—Dessert. October–December. Of American origin, a favourite exhibition variety and for orchard-house culture. Tree of free growth, but forms a fine bush or pyramid on the Paradise. Requires a warm or sheltered position. Fruit very large, round or more frequently conical, even, yellow streaked with bright-red, flavour rich and aromatic when fully ripe.

Wealthy.—Dessert and culinary. November–December. A handsome American Apple which succeeds well in England. Tree erect, rather lax and straggling if not carefully pruned; does best on a Free stock either as a large bush or standard; on the Paradise it sometimes become rather weakly. Fruit medium, round, even, handsomely streaked with bright-red, rich and distinct flavour.

White Transparent.—Culinary. July–August. Hardy, prolific, and early, good for immediate use. Tree remarkably erect and vigorous, with long strong growths; does best on a Dwarfing stock, as it is apt to be too vigorous on a Free stock. Fruit medium, round or ovoid, pale-yellow or nearly white, briskly acid when fresh gathered.

Williams' Favourite.—Dessert. August–September. An American Apple of good appearance and distinct flavour. Tree of medium growth, rather lax and straggling, requires a strong stock and careful pruning; can be grown on either stock. Fruit medium, conical, bright-red, soft, and rich aromatic flavour.

Winter Greening.—Culinary. November–May. An excellent prolific variety for the kitchen, and remarkable for the great length of time it will keep sound—in exceptional cases for eighteen months or two years. Tree of free growth, and adapted as a bush for the Paradise,



Fig. 892.—Apple. Warner's King. (3.)

or as a standard on the Crab. Fruit of medium size, round, deep-green, very firm and acid.

Winter Quarrenden.—Dessert. November–December. Prolific, hardy, and valuable for garden or market. Tree of free growth, but forming good bushes on the Paradise. Fruit medium, resembling Devonshire Quarrenden, deeply coloured, sweet, and of good aromatic flavour.

Worcester Pearmain (fig. 893).—Dessert. September–October. Prolific, hardy, and profitable; valuable for

gardens or market. Tree much branched, and of medium strength on a Dwarfing stock; in some soils subject to canker. Succeeds on a Free stock, forming a good standard of compact growth, bearing early, and continuing regularly productive. Fruit medium, rather conical,



Fig 893.—Apple. Worcester Pearmain. ($\frac{1}{2}$)

yellowish with abundant bright-red tint, sweet and good flavour early in the season and when fresh gathered.

Yellow Ingestrie.—Dessert. September. Hardy and prolific; a useful market variety, though small. Tree of medium growth; forms small bushes on the Paradise, vigorous bushes and fine standards on the Crab. Fruit small, conical or oblong, even, deep-yellow, brisk somewhat acid flavour.

Yorkshire Greening.—Culinary. October–January. An excellent variety, hardy, and free. Tree vigorous, suitable for the Free stock as a standard; can also be grown as a strong open bush. Fruit large, flattened, slightly angular, green with red, sharply acid, but first-rate for cooking.

SELECTIONS OF THE BEST APPLES FOR SPECIAL PURPOSES.

In the following lists it has been the object to include only the varieties which have given satisfaction for the particular purposes under different conditions. Many others might be included, but the longer the lists the more perplexing they are to the inexperienced. Sufficient have been named for collections of any extent, and the smaller lists will be found useful to those who only require a few varieties.

Thirty-six Dessert Apples.

Adams' Pearmain.	Nov.–Feb.	Egremont Russet.	Oct.–Nov.
Allen's Everlasting.	Mar.–May.	Fearn's Pippin.	Jan.–Mar.
Allington Pippin.	Nov.–Feb.	Golden Pippin.	Nov.–April.
Ashmead's Kernel.	Nov.–May.	Golden Reinette.	Nov.–Feb.
Beauty of Bath.	July–Aug.	Hubbard's Pearmain.	Nov.–Apr.
Boston Russet.	Feb.–April.	Keddestone Pippin.	Dec.–Mar.
Braddick's Nonpareil.		Kerry Pippin.	Sept.–Oct.
	Oct.–Dec.	King of the Pippins.	Oct.–Jan.
Brownlees' Russet.	Nov.–Mar.	Lady Sudeley.	Aug.–Sept.
Claygate Pearmain.	Jan.–Feb.	Langley Pippin.	Sept.
Cockle's Pippin.	Jan.–Mar.	Mabbott's Pearmain.	Oct.–Dec.
Cornish Aromatic.	Oct.–Jan.	Margaret.	Aug.
Cox's Orange Pippin.	Nov.–Feb.	Margil.	Oct.–Jan.
Devonshire Quarrenden.	Aug.	Mr. Gladstone.	July–Aug.
Early Peach (or Irish Peach).		Nonpareil.	Jan.–May.
	Aug.	Ribston Pippin.	Dec.

Ross Nonpareil.	Nov.–Jan.	Sturmer Pippin.	Feb.–June.
Roundway Magnum Bonum.		Winter Quarrenden.	Nov.–Dec.
	Nov.–Feb.	Worcester Pearmain.	
Scarlet Pearmain.	Oct.–Jan.		Sept.–Oct.

Twenty-four Dessert Apples.

Allen's Everlasting.	Mar.–May.	Keddestone Pippin.	Dec.–Mar.
Allington Pippin.	Nov.–Feb.	Kerry Pippin.	Sept.–Oct.
Beauty of Bath.	July–Aug.	King of the Pippins.	Oct.–Jan.
Brownlees' Russet.	Nov.–Mar.	Lady Sudeley.	Aug.–Sept.
Claygate Pearmain.	Jan.–Feb.	Mabbott's Pearmain.	Oct.–Dec.
Cornish Aromatic.	Oct.–Jan.	Margil.	Oct.–Jan.
Cox's Orange Pippin.	Nov.–Feb.	Ribston Pippin.	Dec.
Devonshire Quarrenden.	Aug.	Roundway Magnum Bonum.	
Early Peach (or Irish Peach).			Nov.–Feb.
	Aug.	Scarlet Pearmain.	Oct.–Jan.
Fearn's Pippin.	Jan.–Mar.	Sturmer Pippin.	Feb.–June.
Golden Pippin.	Nov.–April.	Winter Quarrenden.	Nov.–Dec.
Hubbard's Pearmain.		Worcester Pearmain.	
	Nov.–April.		Sept.–Oct.

Twelve Dessert Apples.

Beauty of Bath.	July–Aug.	Keddestone Pippin.	Dec.–Mar.
Claygate Pearmain.	Jan.–Feb.	King of the Pippins.	Oct.–Jan.
Cox's Orange Pippin.	Nov.–Feb.	Mabbott's Pearmain.	Oct.–Dec.
Devonshire Quarrenden.	Aug.	Roundway Magnum Bonum.	
Early Peach (or Irish Peach).			Nov.–Feb.
	Aug.	Sturmer Pippin.	Feb.–June.
Fearn's Pippin.	Jan.–Mar.	Worcester Pearmain.	Sept.–Oct.

Six Dessert Apples.

Beauty of Bath.	July–Aug.	Fearn's Pippin.	Jan.–Mar.
Cox's Orange Pippin.	Nov.–Feb.	King of the Pippins.	Oct.–Jan.
Devonshire Quarrenden.	Aug.	Worcester Pearmain.	Sept.–Oct.

Three Dessert Apples.

Cox's Orange Pippin.	November–February.
Fearn's Pippin.	January–March.
Worcester Pearmain.	September–October.

One Dessert Apple.

Cox's Orange Pippin.	November–February.
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Thirty-six Culinary Apples.

Alfriston.	Nov.–Mar.	Lord Derby.	Nov.–Dec.
Annie Elizabeth.	Dec.–April.	Lord Grosvenor.	Aug.–Sept.
Beauty of Kent.	Nov.–Jan.	Mère de Ménage.	Dec.–Jan.
Bedfordshire Foundling.		New Hawthornden.	Nov.–Dec.
	Nov.–Feb.	New Northern Greening.	
Bismarck.	Oct.–Feb.		Nov.–April.
Bramley's Seedling.	Dec.–May.	Newton Wonder.	Nov.–May.
Castle Major.	Oct.–Nov.	Norfolk Beefing.	Jan.–May.
Domino.	Aug.–Sept.	Northern Dimpling.	
Duchess of Oldenburg.			Sept.–Oct.
	Aug.–Sept.	Peasgood's Nonesuch.	
Dumelow's Seedling.	Nov.–Mar.		Nov.–Dec.
Ecklinville.	Sept.–Nov.	Potts' Seedling.	Aug.–Oct.
Gloria Mundi.	Dec.–Jan.	Royal Jubilee.	Oct.–Feb.
Golden Noble.	Oct.–Dec.	Royal Russet.	Nov.–May.
Hanwell Souring.	Dec.–Mar.	Schoolmaster.	Oct.–Dec.
Hawthornden.	Oct.–Dec.	Stirling Castle.	Oct.–Dec.
Herefordshire Beefing.		Tyler's Kernel.	Oct.–Dec.
	Nov.–Jan.	Warner's King.	Nov.–Dec.
Lane's Prince Albert.	Nov.–Mar.	Winter Greening.	Nov.–May.
Loddington.	Aug.–Dec.	Yorkshire Greening.	Oct.–Jan.

Twenty-four Culinary Apples.

Annie Elizabeth.	Dec.–April.	Lord Derby.	Nov.–Dec.
Beauty of Kent.	Nov.–Jan.	Lord Grosvenor.	Aug.–Sept.
Bismarck.	Oct.–Feb.	Mère de Ménage.	Dec.–Jan.
Bramley's Seedling.	Dec.–May.	New Hawthornden.	Nov.–Dec.
Dumelow's Seedling.	Nov.–Mar.	New Northern Greening.	
Ecklinville.	Sept.–Nov.		Nov.–April.
Gloria Mundi.	Dec.–Jan.	Newton Wonder.	Nov.–May.
Golden Noble.	Oct.–Dec.	Potts' Seedling.	Aug.–Oct.
Hawthornden.	Oct.–Dec.	Royal Jubilee.	Oct.–Feb.
Herefordshire Beefing.		Royal Russet.	Nov.–May.
	Nov.–Jan.	Stirling Castle.	Oct.–Dec.
Lane's Prince Albert.	Nov.–Mar.	Warner's King.	Nov.–Dec.
Loddington.	Aug.–Dec.	Yorkshire Greening.	Oct.–Jan.

Twelve Culinary Apples.

Bismarck.	Oct.-Feb.	New Hawthornden.	Nov.-Dec.
Bramley's Seedling.	Dec.-May.	Newton Wonder.	Nov.-May.
Dumelow's Seedling.	Nov.-Mar.	Potts' Seedling.	Aug.-Oct.
Lane's Prince Albert.	Nov.-Mar.	Royal Russet.	Nov.-May.
Lord Grosvenor.	Aug.-Sept.	Stirling Castle.	Oct.-Dec.
New Northern Greening.	Nov.-April.	Warner's King.	Nov.-Dec.

Six Culinary Apples.

Bramley's Seedling.	Dec.-May.	Newton Wonder.	Nov.-May.
Lane's Prince Albert.	Nov.-Mar.	Potts' Seedling.	Aug.-Oct.
Lord Grosvenor.	Aug.-Sept.	Stirling Castle.	Oct.-Dec.

Three Culinary Apples.

Bramley's Seedling.	December-May.
Lane's Prince Albert.	November-March.
Potts' Seedling.	August-October.

One Culinary Apple.

Lane's Prince Albert.	November-March.
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Twenty-four Dessert and Culinary Apples.

Baumann's Red Winter	Harvey's Wiltshire Defiance.
Reinette.	Oct.-Dec.
Baxter's Pearmain.	Herefordshire Pearmain.
Blenheim Pippin.	Nov.-Dec.
Cardinal.	Hornhead Pearmain.
Cellini.	Dec.-April.
Cobham.	King of Tompkins' County.
Cox's Pomona.	Dec.-Feb.
Dutch Mignonne.	Lady Henniker.
Early Harvest.	Dec.-Jan.
Gascoyne's Scarlet Seedling.	Lewis' Incomparable.
Nov.-Feb.	Dec.-Feb.
Golden Spire.	Reinette de Canada.
Oct.-Dec.	Nov.-Mar.
Grange's Pearmain.	Rosemary Russet.
Jan.-Mar.	Dec.-Feb.
Greenup's Pippin.	The Queen.
Oct.-Dec.	Oct.-Jan.
	The Sandringham.
	Nov.-Jan.
	Wealthy.
	Nov.-Dec.

Twelve Dessert and Culinary Apples.

Baumann's Red Winter	Gascoyne's Scarlet Seedling.
Reinette.	Nov.-Feb.
Baxter's Pearmain.	Harvey's Wiltshire Defiance.
Blenheim Pippin.	Oct.-Dec.
Cox's Pomona.	Hornhead Pearmain.
Oct.-Nov.	Dec.-April.
Dutch Mignonne.	Lady Henniker.
Dec.-Mar.	Dec.-Jan.
Early Harvest.	Rosemary Russet.
Aug.	Dec.-Feb.
	Wealthy.
	Nov.-Dec.

Six Dessert and Culinary Apples.

Baumann's Red Winter	Hornhead Pearmain.
Reinette.	Dec.-April.
Cox's Pomona.	Rosemary Russet.
Oct.-Nov.	Dec.-Feb.
Gascoyne's Scarlet Seedling.	Wealthy.
Nov.-Feb.	Nov.-Dec.

Three Dessert and Culinary Apples.

Baumann's Red Winter	Cox's Pomona.
Reinette.	Oct.-Nov.
	Hornhead Pearmain.
	Dec.-April.

Twenty-four Richly-flavoured Apples.

Allen's Everlasting.	Mar.-May.	Egremont Russet.	Oct.-Nov.
American Mother.	Oct.-Nov.	Fearn's Pippin.	Jan.-Mar.
Ashmead's Kernel.	Nov.-May.	Golden Harvey.	Dec.-May.
Boston Russet.	Feb.-April.	Keddlestone Pippin.	Dec.-Mar.
Braddick's Nonpareil.	Oct.-Dec.	Kerry Pippin.	Sept.-Oct.
		Mabbott's Pearmain.	Oct.-Dec.
Brownlee's Russet.	Nov.-Mar.	Mannington's Pearmain.	Nov.-Dec.
Claygate Pearmain.	Jan.-Feb.	Margil.	Oct.-Jan.
Cornish Aromatic.	Oct.-Jan.	Nonpareil.	Jan.-May.
Cox's Orange Pippin.	Nov.-Feb.	Ribston Pippin.	Dec.
D'Arcy Spice.	Feb.-Mar.	Rosemary Russet.	Dec.-Feb.
Duke of Devonshire.	Mar.-May.	Sturmer Pippin.	Feb.-June.
Early Nonpareil.	Oct.-Dec.		

Twelve Richly-flavoured Apples.

American Mother.	Oct.-Nov.	Keddlestone Pippin.	Dec.-Mar.
Boston Russet.	Feb.-April.	Mannington's Pearmain.	Nov.-Dec.
Braddick's Nonpareil.	Oct.-Dec.	Nonpareil.	Jan.-May.
		Ribston Pippin.	Dec.
Cornish Aromatic.	Oct.-Jan.	Rosemary Russet.	Dec.-Feb.
Cox's Orange Pippin.	Nov.-Feb.	Sturmer Pippin.	Feb.-June.
Egremont Russet.	Oct.-Nov.		

Six Richly-flavoured Apples.

American Mother.	Oct.-Nov.	Egremont Russet.	Oct.-Nov.
Braddick's Nonpareil.	Oct.-Dec.	Mannington's Pearmain.	Nov.-Dec.
Cox's Orange Pippin.	Nov.-Feb.	Nonpareil.	Jan.-May.

Three Richly-flavoured Apples.

Braddick's Nonpareil.	Oct.-Dec.	Mannington's Pearmain.	Nov.-Dec.
Cox's Orange Pippin.	Nov.-Feb.		

Twelve Handsome and Coloured Dessert Apples.

Adams' Pearmain.	Nov.-Feb.	Devonshire Quarrenden.	Aug.
Beauty of Bath.	July-Aug.	Duchess's Favourite.	Sept.-Dec.
Braddick's Nonpareil.	Oct.-Dec.	King of the Pippins.	Oct.-Jan.
		Lady Sudeley.	Aug.-Sept.
Charles Ross.	Sept.-Dec.	Langley Pippin.	Sept.
Cornish Aromatic.	Oct.-Jan.	Worcester Pearmain.	Sept.-Oct.
Cox's Orange Pippin.	Nov.-Feb.		

Twelve Handsome and Coloured Dessert and Culinary Apples.

Baldwin.	Nov.-Mar.	Greenup's Pippin.	Oct.-Dec.
Baumann's Red Winter	Dec.-Mar.	Harvey's Wiltshire Defiance.	Oct.-Dec.
Reinette.	Aug.-Sept.	King of Tompkins' County.	Dec.-Feb.
Cardinal.	Aug.-Nov.	The Queen.	Oct.-Jan.
Cellini.	Oct.-Nov.	The Sandringham.	Nov.-Jan.
Cox's Pomona.	Nov.-Feb.	Wealthy.	Nov.-Dec.
Gascoyne's Scarlet Seedling.			

Twelve Handsome and Coloured Culinary Apples.

Beauty of Kent.	Nov.-Jan.	Maltster.	Oct.-Dec.
Bismarck.	Oct.-Feb.	Mère de Ménage.	Dec.-Jan.
Brabant Bellefleur.	Nov.-Mar.	Norfolk Beefing.	Jan.-May.
Duchess of Oldenburg.	Aug.-Sept.	Peasgood's Nonesuch.	Nov.-Dec.
		Striped Beefing.	Oct.-May.
Emperor Alexander.	Sept.-Dec.	Tyler's Kernel.	Oct.-Dec.
Herefordshire Beefing.	Nov.-Jan.		

Twelve of the Largest Dessert and Culinary Apples.

Belle de Pontoise.	Dec.-Mar.	King of Tompkins' County.	Dec.-Feb.
Blenheim Pippin.	Nov.-Feb.	Lady Henniker.	Dec.-Jan.
Cobham.	Nov.-Feb.	Reinette de Canada.	Nov.-Mar.
Cox's Pomona.	Oct.-Nov.	Rhode Island Greening.	Nov.-April.
Gascoyne's Scarlet Seedling.	Nov.-Feb.	The Queen.	Oct.-Jan.
Harvey's Wiltshire Defiance.	Oct.-Dec.	The Sandringham.	Nov.-Jan.

Eighteen of the Largest Culinary Apples.

Alfriston.	Nov.-Mar.	Mère de Ménage.	Dec.-Jan.
Beauty of Kent.	Nov.-Jan.	New Northern Greening.	Nov.-April.
Bramley's Seedling.	Dec.-May.	Newton Wonder.	Nov.-May.
Castle Major.	Oct.-Nov.	Peasgood's Nonesuch.	Nov.-Dec.
Ecklinville.	Sept.-Nov.	Royal Jubilee.	Oct.-Feb.
Gloria Mundi.	Dec.-Jan.	Striped Beefing.	Oct.-May.
Golden Noble.	Oct.-Dec.	Tower of Glammis.	Nov.-Feb.
Lane's Prince Albert.	Nov.-Mar.	Warner's King.	Nov.-Dec.
Loddington.	Aug.-Dec.		
Lord Derby.	Nov.-Dec.		

Twelve Early Dessert Apples.

Beauty of Bath.	July-Aug.	Mr. Gladstone.	July-Aug.
Devonshire Quarrenden.	Aug.	Red Astrachan.	Aug.-Sept.
Duchess's Favourite.	Sept.-Dec.	Williams' Favourite.	Aug.-Sept.
Early Peach (or Irish Peach).	Aug.	Worcester Pearmain.	Sept.-Oct.
Lady Sudeley.	Aug.-Sept.	Yellow Ingestrie.	Sept.
Langley Pippin.	Sept.		
Margaret.	Aug.		

Twelve Early Culinary Apples.

Domino.	Aug.-Sept.	Keswick Codlin.	Aug.-Sept.
Duchess of Oldenburg.	Aug.-Sept.	Loddington.	Aug.-Dec.
	Aug.-Sept.	Lord Grosvenor.	Aug.-Sept.
Early Julian.	Aug.-Sept.	Lord Suffield.	Aug.-Sept.
Early Rivers.	July-Aug.	Manks Codlin.	Sept.-Oct.
Frogmore Prolific.	Aug.-Sept.	Potts' Seedling.	Aug.-Oct.
Gold Medal.	Sept.-Oct.		

Twelve Late-keeping Dessert Apples.

Allen's Everlasting.	Mar.-May.	D'Arcy Spice.	Feb.-Mar.
Ashmead's Kernel.	Nov.-May.	Duke of Devonshire.	Mar.-May.
Boston Russet.	Feb.-April.	Fearn's Pippin.	Jan.-Mar.
Brownlee's Russet.	Nov.-Mar.	Hubbard's Pearmain.	Nov.-Apr.
Cockle's Pippin.	Jan.-Mar.	Nonpareil.	Jan.-May.
Court-Pendu-Plat.	Feb.-April.	Sturmer Pippin.	Feb.-June.

Twelve Late-keeping Culinary Apples.

Alfriston.	Nov.-Mar.	New Northern Greening.	
Annie Elizabeth.	Dec.-April.		Nov.-April.
Bramley's Seedling.	Dec.-May.	Newton Wonder.	Nov.-May.
Dumelow's Seedling.	Nov.-Mar.	Norfolk Beefing.	Jan.-May.
Hanwell Souring.	Dec.-Mar.	Royal Russet.	Nov.-May.
Minchull Crab.	Nov.-Mar.	Striped Beefing.	Oct.-May.
		Winter Greening.	Nov.-May.

Twelve Apples for Standards (Dessert Varieties).

Beauty of Bath.	July-Aug.	King of the Pippins.	Oct.-Jan.
Christmas Pearmain.	Nov.-Dec.	Lady Sudeley.	Aug.-Sept.
Cox's Orange Pippin.	Nov.-Feb.	Margaret.	Aug.
Devonshire Quarrenden.	Aug.	Mr. Gladstone.	July-Aug.
Duchess's Favourite.	Sept.-Dec.	Ross Nonpareil.	Nov.-Jan.
Duke of Devonshire.	Mar.-May.	Yellow Ingestrie.	Sept.

Twelve Apples for Standards (Culinary Varieties).

Annie Elizabeth.	Dec.-April.	Lord Derby.	Nov.-Dec.
Bismarck.	Oct.-Feb.	Lord Grosvenor.	Aug.-Sept.
Bramley's Seedling.	Dec.-May.	New Northern Greening.	
Dumelow's Seedling.	Nov.-Mar.		Nov.-April.
Golden Noble.	Oct.-Dec.	Newton Wonder.	Nov.-May.
Loddington.	Aug.-Dec.	Potts' Seedling.	Aug.-Oct.
		Warner's King.	Nov.-Dec.

Twelve Apples for Standards (Dessert and Culinary Varieties).

Baumann's Red Winter		Golden Spire.	Oct.-Dec.
Reinette.	Dec.-Mar.	Harvey's Wiltshire Defiance.	
Belle de Pontoise.	Dec.-Mar.		Oct.-Dec.
Blenheim Pippin.	Nov.-Feb.	Hormead Pearmain.	
Cobham.	Nov.-Feb.		Dec.-April.
Cox's Pomona.	Oct.-Nov.	Lady Henniker.	Dec.-Jan.
Gascoyne's Scarlet Seedling.	Nov.-Feb.	Rosemary Russet.	Dec.-Feb.
		Wealthy.	Nov.-Dec.

Twelve Strong Apples for Standards.

Cox's Orange Pippin.	Dessert.	Nov.-Feb.
King of the Pippins.		Oct.-Jan.
Mr. Gladstone.		July-Aug.
Yellow Ingestrie.		Sept.
Bismarck.	Culinary.	Oct.-Feb.
Bramley's Seedling.		Dec.-May.
Golden Noble.		Oct.-Dec.
Newton Wonder.		Nov.-May.
Warner's King.		Nov.-Dec.
Blenheim Pippin.	Dessert and Culinary.	Nov.-Feb.
Gascoyne's Scarlet Seedling.		Oct.-Nov.
Harvey's Wiltshire Defiance.		Nov.-Feb.
		Oct.-Dec.

Twelve Prolific Apples as Bushes.

Cox's Orange Pippin.	Dessert.	Nov.-Feb.
Fearn's Pippin.		Jan.-Mar.
King of the Pippins.		Oct.-Jan.
Worcester Pearmain.		Sept.-Oct.
Lord Grosvenor.	Culinary.	Nov.-Mar.
Potts' Seedling.		Aug.-Sept.
Stirling Castle.		Aug.-Oct.
Lane's Prince Albert.		Oct.-Dec.
Baumann's Red Winter Reinette.	Dessert and Culinary.	Dec.-Mar.
Cox's Pomona.		Oct.-Nov.
Gascoyne's Scarlet Seedling.		Nov.-Feb.
Wealthy.		Nov.-Dec.

Twelve Hardy Culinary Apples for Northern and Cold Districts.

Alfriston.	Nov.-Mar.	Mère de Ménage.	Dec.-Jan.
Bedfordshire Foundling.		New Northern Greening.	
	Nov.-Feb.		Nov.-April.
Bramley's Seedling.	Dec.-May.	Newton Wonder.	Nov.-May.
Gloria Mundi.	Dec.-Jan.	Potts' Seedling.	Aug.-Oct.
Greenup's Pippin.	Oct.-Dec.	Winter Greening.	Nov.-May.
Lord Grosvenor.	Aug.-Sept.	Yorkshire Greening.	Oct.-Jan.

Twelve Hardy Dessert Apples for Northern and Cold Districts.

Adams' Pearmain.	Nov.-Feb.	Fearn's Pippin.	Jan.-Mar.
Braddick's Nonpareil.	Oct.-Dec.	Keddlestone Pippin.	Dec.-Mar.
Claygate Pearmain.	Jan.-Feb.	Kerry Pippin.	Sept.-Oct.
Devonshire Quarrenden.	Aug.	King of the Pippins.	Oct.-Jan.
Early Harvest.	Aug.	Margil.	Oct.-Jan.
Early Peach (or Irish Peach).	Aug.	Yellow Ingestrie.	Sept.

Twelve Apples for warm Southern Districts or Walls.

American Mother.	Oct.-Nov.	Gravenstein.	Oct.-Dec.
Calville Blanche d'Hiver.		King of Tompkins' County.	
	Jan.-Mar.		Dec.-Feb.
Calville Malingre.	Jan.-Mar.	Melon Apple.	Nov.-Dec.
Cornish Aromatic.	Oct.-Jan.	Newtown Pippin.	Dec.-April.
Cornish Gilliflower.	Jan.-May.	Reinette de Canada.	Nov.-Mar.
D'Arcy Spice.	Feb.-Mar.	Washington.	Oct.-Dec.

Eighteen Apples for Espaliers or Cordons.

DESSERT.

Beauty of Bath.	July-Aug.	King of the Pippins.	Oct.-Jan.
Cox's Orange Pippin.	Nov.-Feb.	Margil.	Oct.-Jan.
Fearn's Pippin.	Jan.-Mar.	Worcester Pearmain.	Sept.-Oct.

DESSERT AND CULINARY.

Baxter's Pearmain.	Nov.-Mar.	Lady Henniker.	Dec.-Jan.
Beauty of Kent.	Nov.-Jan.	Lewis' Incomparable.	Dec.-Feb.
Bismarck.	Oct.-Feb.	Rhode Island Greening.	
Dutch Mignonne.	Dec.-Mar.		Nov.-April.
Emperor Alexander.	Sept.-Dec.	The Queen.	Oct.-Jan.
Golden Noble.	Oct.-Dec.	The Sandringham.	Nov.-Jan.
Hormead Pearmain.	Dec.-Apr.		

Apples for Scotland.

(Selected by 77 cultivators at the last Scottish Apple and Pear Congress. The numbers in brackets indicate the number of exhibitors who had found the varieties succeed under widely differing conditions.)

DESSERT VARIETIES.

Blenheim Pippin (53).	Nov.-Feb.	Irish Peach (43).	Aug.
Court of Wick (24).	Oct.-Mar.	Kerry Pippin (44).	Sept.-Oct.
Cox's Orange Pippin (41).		King of the Pippins (63).	
	Nov.-Feb.		Oct.-Jan.
Duke of Devonshire (16).		Ribston Pippin (48).	Dec.
	Mar.-May.		

CULINARY.

Alfriston (51).	Nov.-Mar.	Lord Suffield (61).	Aug.-Sept.
Dumelow's Seedling (51).		Northern Greening (21).	
	Nov.-Mar.		Nov.-April.
Ecklinville (66).	Sept.-Nov.	Stirling Castle (62).	Oct.-Dec.
Hawthornden (31).	Oct.-Dec.	Tower of Glammis (25).	Nov.-Feb.
Keswick Codlin (54).	Aug.-Sept.	Warner's King (55).	Nov.-Dec.

SYNONYMS OF APPLES.

Alexander, see Emperor Alexander.
Arundel Pearmain, see Hormead Pearmain.
Baddow Pippin, see D'Arcy Spice.
Belle Dubois, see Gloria Mundi.
Black Blenheim, see Hambleton Deux Ans.
Blenheim Orange, see Blenheim Pippin.
Borovitsky, see Duchess of Oldenburg.
Brandy Apple, see Golden Harvey.
Cambridge Pippin, see Bedfordshire Foundling.
Clifton Nonesuch, see Fearn's Pippin.
Counseller, see Greenup's Pippin.
Crystal Palace, see Gold Medal.

D. T. Fish, see Warner's King.
Duchess of Gloucester, see Duchess' Favourite.
Early Crofton, see Irish Peach.
Early Julien, see Early Julian.
Early Red Margaret, see Margaret.
Fair Lady, see Early Julian.
French Crab, see Winter Greening.
Glory of England, see Gascoyne's Scarlet Seedling.
Glory of Flanders, see Brabant Bellefleur.
Golden Drop, see Court of Wick.
Golden Winter Pearmain, see King of the Pippins.
Hick's Fancy, see Early Nonpareil.
Ingestrie, see Yellow Ingestrie.
Irish Pitcher, see Manks Codlin.
Iron Apple, see Brabant Bellefleur.
Jackson's Seedling, see Mr. Gladstone.
Jacob's Strawberry, see Lady Sudeley.
July Pippin, see Early Harvest.
King Apple, see Warner's King.
Lammas, see Margaret.
Leather Coat, see Royal Russet.
London Major, see Lord Derby.
Mother Apple, see American Mother.
Never Fail, see Margil.
Normanton Wonder, see Dumelow's Seedling.
Nutmeg Pippin, see Cockle's Pippin.
Old Golden Pippin, see Golden Pippin.
Old Hawthornden, see Hawthornden.
Ox Apple, see Gloria Mundi.
Peter the Great, see Cardinal.
Poor Man's Friend, see Warner's King.
Pope's Apple, see Cobham.
Prince Bismarck, see Bismarck.
Prince's Pippin, see King of the Pippins.
Red Hawthornden, see Greenup's Pippin.
Red Juneating, see Margaret.
Sandringham, see The Sandringham.
Scarlet Incomparable, see Duchess' Favourite.
Scorpion, see Harvey's Wiltshire Defiance.
Shepherd's Pippin, see Alfriston.
South Lincoln Beauty, see Allington Pippin.
Spring Ribston Pippin, see D'Arcy Spice.
Stone's Apple, see Loddington.
Summer Golden Pippin, see Yellow Ingestrie.
Summer Peach, see Duchess of Oldenburg.
Tom Matthews, see Golden Spire.
Watch Apple, see Cambusnethan Pippin.
Wellington, see Dumelow's Seedling.
Wise Apple, see Court Pendu Plat.
Woodstock Pippin, see Blenheim Orange Pippin.
Yorkshire Beauty, see Greenup's Pippin.

[R. L. C.]

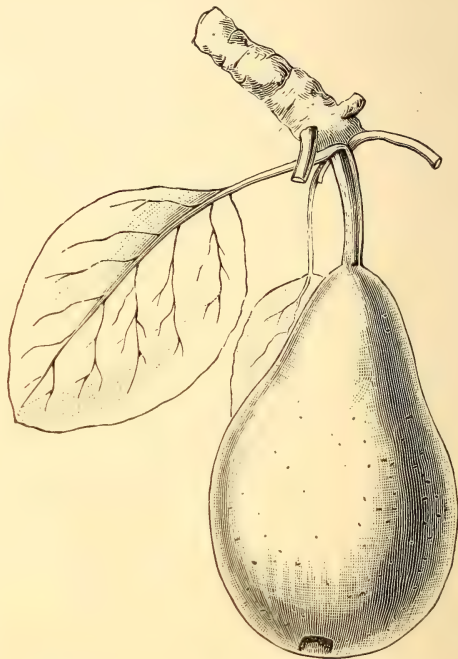
CHAPTER V.

PEARS.

HISTORY—EVOLUTION—IMPROVEMENT—FLAVOUR—FOR ORNAMENTAL PURPOSES—GENERAL CULTURE—DISTRICTS—SITUATION—SOIL—STOCKS—DOUBLE-GRAFTING—FORMS OF TREES—ARRANGEMENT AND DISTANCES—PLANTING—PRUNING AND TRAINING—DWARF BUSHES—AGAINST WALLS—FERTILITY AND STERILITY—ROUTINE CULTURE—GATHERING—PROPAGATION—QUINCE STOCKS—DISEASES—PEARS FOR MARKET—FOREIGN TRADE—HOME TRADE—SELECT LIST.

As one of the most delicious dessert fruits at the command of the British cultivator, the Pear has attained a high degree of popularity amongst those fruits which are generally hardy in this climate. On the basis of general utility, and for its dietetic value, it cannot be considered

as rivalling the Apple, yet as a garden fruit, and, in favourable situations, for commercial purposes, it must always occupy a prominent place. The fruits are especially appreciated for their remarkably varied, distinct, aromatic flavours, and for the peculiarly melting and butter-like consistence of the flesh of a large number of varieties. Then as regards the period during which the fruit is available for use, the Pear is unsurpassed, as while fresh fruits from the earliest varieties can be had ripe from the trees

Fig. 894.—Wild Pear (*Pyrus communis*). (Natural size.)

in July, the latest varieties will retain their good qualities until May or June, thus almost completing the circle of the year.

By far the most important use of the Pear is as a dessert fruit, but this is by no means the only way in which it can be extensively utilized. For stewing or baking some varieties are admirably adapted, and, in fact, this is a purpose for which most of the later sorts are suitable, and they can be so employed especially in seasons or situations where the fruit is not sufficiently matured for table use in a fresh state. In America and elsewhere, where the commercial cultivation of the Pear is conducted on a large scale, "canning" or preserving the fruits in syrup has become an important industry, the popular Williams' Bon Chrétien, under the name of Bartlett, being the variety chiefly employed.

Drying the fruits for export is another method that has been largely adopted in recent years, and in seasons of great abundance it is a convenient means of utilizing the crop. In some of the British colonies the cultivation of Pears is being considerably extended, and it is probable that similar systems will be tried when the crops are excessive, and the prices realized are too low to pay for export. Here in the United Kingdom, however, there is always an ample demand for the best Pears in a fresh state, and home cultivators in the most favourable districts find them a satisfactory investment.

The manufacture of perry is still of some importance in a few districts of England and France, but it does not receive the same attention as cider production generally, though it is a very palatable liquor at its best.

The numerous varieties of Pears have mainly originated from *Pyrus communis* (fig. 894), which is wild throughout a great part of the temperate and mountainous regions of Europe, and the western portion of Asia. It occurs in many parts of England, but is not so abundant generally as the Crab, and is more frequently found in woods and coppice than in hedgerows. Like the original type of the Apple, the Pear, when really in a wild state, and not merely an escape from gardens as a seedling from cultivated varieties, shows but little difference in the fruits from the earliest known to have been used by man. The fruits which were collected by the lake-dwellers in Switzerland, and either used for food as gathered, or dried and preserved for winter use, were small, hard, and untempting, just as those produced by our wild Pear are at the present time. That variations are induced by special conditions of soil and situation there can be no doubt, but though it has been stated

on good authority that there is little difficulty in distinguishing wild Pears from seedlings that have originated from garden varieties, this is open to question. We have raised seedlings from some of the best cultivated varieties, and have found among them forms that could not



Fig. 895.—*Pyrus nivalis*. (Natural size.)

be distinguished in any character of habit, wood, or foliage, and occasionally even of the fruit, from the wild forms.

Another interesting form of *Pyrus* is that known as the "Snow Pear" or "Sage-leaved Pear", *Pyrus nivalis* or *salvæfolia* (fig. 895), a near ally of *P. communis*. This is the "Poirier Sauger" of the French, and is cultivated in some of the southern countries of Europe. Most of the perry Pears grown in France seem to owe their origin to it, but it is difficult to trace what influence it has had upon the de-

velopment of garden Pears generally. A third type, *Pyrus sinensis*, a native of China, and cultivated both in China and Japan, possesses a large share of interest in connection with future possible development or adaptation of Pears to different climates, and we shall refer to this more fully in speaking of the improvement of the fruit.

The recorded history of the Pear, as far as we are concerned, may be said to commence with the time of the Romans, for Pliny gives the names and brief descriptions of varieties which were distinguished by special flavours,

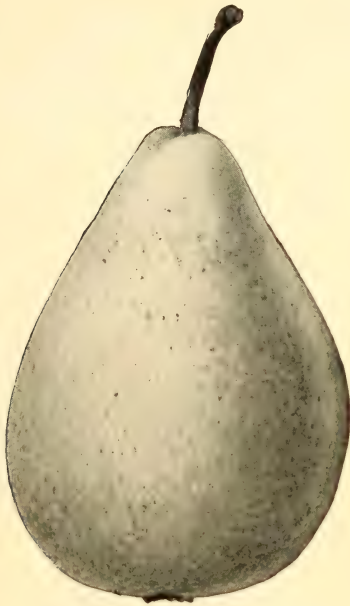


Fig. 896.—Pear. Cuisse Madame. (3.)

amongst which some were considered to resemble favourite Roman wines; and even as early as that the musky aroma, which has become a notable character of many fine varieties of modern origin, had been developed. It is impossible at the present time to identify any of the Roman Pears with the oldest varieties still in cultivation, and it is probable that they have long since been lost.

From the earliest historical time much attention has been paid to Pears in France, the climate in a large portion of the country being suited to the best development of the fruit. Some hundreds of distinct varieties were grown in French gardens many years before they were counted by dozens here. An example of the progress made in early times is afforded by the catalogue issued by Le Lectier of Orleans in 1628, which is the first exhaustive list pub-

lished, and which enumerates no less than 260 varieties. These include such names as Cuisse Madame (fig. 896), Jargonelle, Martin Sec, and Bon Chrestien. Subsequent lists became more of the nature of selections, rarely exceeding 100 varieties, until the nursery catalogues of the nineteenth century multiplied the numbers. In Leroy's *Dictionnaire de Pomologie*, the two volumes devoted to Pears (1867–69) included 915 varieties, which were fully described, and the majority illustrated, constituting probably the longest list of varieties of one kind of fruit with systematic descriptions ever printed.

It is probable that the Romans introduced some of their Pears into Britain, but in subsequent years it is certain that a large majority of the varieties grown in this country were brought here from France, and it is difficult to indicate many old varieties of British origin. Most of the early writers on horticulture notice the Pear. Parkinson, in 1629, refers to 64 varieties; Wise, seventy years later, names 73, many of which were then considered of little value in this climate. In 1707 Mortimer named 138 varieties, but during that century the number was enormously increased, and, in 1829, G. W. Johnson states in his *History of English Gardening*, that 630 varieties of Pears were then in cultivation in this country. Here, as in France, selection has been in operation, and the late Dr. Hogg described in the different editions of his monumental work, *The Fruit Manual*, the following numbers of Pears as indicating the best grown in the British Isles.

First Edition (1847), 81 varieties.
Second Edition (1862), 279 varieties.
Third Edition (1866), 374 varieties.
Fourth Edition (1875), 581 varieties.
Fifth Edition (1884), 647 varieties.

At a Conference of the Royal Horticultural Society held at Chiswick in 1885, fruits of 616 varieties were represented, but the total number in cultivation in the British Islands would probably far exceed 1000, while on the Continent the number recorded is even greater. There is little doubt that quite three-fourths of these could be discarded with advantage, and nurserymen would gladly have their stocks limited to fewer varieties. One method to attain this end would be to adopt the plan of an old trade grower, who classified his Pears under the heads "Good", "Inferior", and "Worthless".

Amongst the known varieties that have been longest in cultivation in Britain the following

are still in cultivation, though some of them are difficult to obtain true. Catherine or Katherine (fig. 897) was much valued in Parkinson's time, the Deux Têtes, the Warden (Black Worcester), and the Windsor also belong to the same period, *i.e.* the sixteenth and seven-

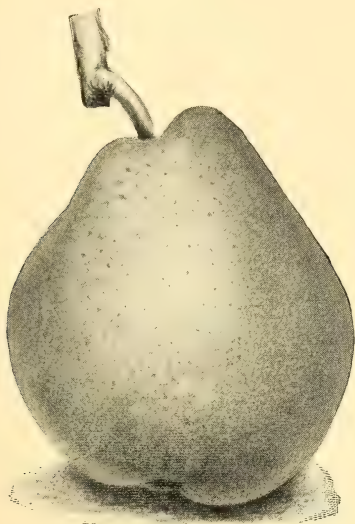


Fig. 897.—Pear. Catherine. ($\frac{1}{2}$.) (Langley, 1729.)

teenth centuries. The Windsor is, however, believed to be a French Pear of much greater antiquity. Easter Bergamot, Martin Sec, and Jargonelle are also old Continental Pears that have had a place in British gardens for probably 200 years or more, and still retain the characters which distinguished them in earlier days.

The Evolution of the Pear.—The majority of the older Pears were no doubt simply selections from chance seedlings or wildings, but whether the latter were variations from wild stocks or escapes from gardens there is no means of determining. Amongst the most noted discoveries of wildings are a few Pears that are highly esteemed now. Besi d'Héry, for instance, was found in the forest of Héry in Brittany; Beurré Bosc was discovered at Apremont; Beurré Diel was found in a village; Beurré Giffard near Angers; Chaumontelle in a garden; and St. Germain on the banks of the river La Fare, near St. Germain; all of those, with the exception of Beurré Giffard, dating from the seventeenth or eighteenth century.

Many Pears, in fact the majority of those now cultivated, including many modern varieties, have originated as chance seedlings. In a few cases we have the names of the seed parent, for instance, Auguste Jurie was raised

from seed of Beurré Giffard, Fertility from Beurré Goubault, Huyshe's Prince of Wales from Gansel's Bergamot, and Suffolk Thorn from the same variety. Actually recorded crosses between distinct varieties are by no means numerous. Gansel-Seckle was from Seckle crossed with Gansel's Bergamot; Huyshe's Prince Consort from Beurré d'Aremberg crossed with Passe Colmar; and Pitmaston Duchess from a cross between Duchesse d'Angoulême and Glou Morceau.

Improvement of Pears.—Although we owe the majority of the older varieties of Pears to France, many of the modern varieties were raised in Belgium, chiefly by a few enthusiastic pomologists, who devoted much time and attention to the raising of new varieties. The Abbé Hardenpoint of Mons was one of the first to engage in the work, about the middle of the eighteenth century, and to him we are indebted for Délices d'Hardenpoint, Glou Morceau, and Passe Colmar. Early in the nineteenth century Major Esperen at Malines and Dr. Van Mons at Louvain applied themselves systematically to the improvement of Pears, and raised large numbers of seedlings. In British gardens at the present time there are about thirteen of Esperen's Pears in cultivation, and ten of these still merit a position amongst the best, including such well-known varieties as Fondante de Malines, Bergamotte Esperen, Besi Esperen, Joséphine de Malines, and Emile d'Heyst. The work accomplished by Van Mons was, however, of a very extraordinary character, as during his career he is said to have raised 80,000 seedling Pears, and in 1823 he had a collection of 2000 selected seedlings of distinct characters. Many of these were ultimately discarded, and others which are satisfactory in Belgium and France are disappointing here. In most authoritative British lists of Pears about forty of Van Mons varieties are enumerated, but of all these only thirteen can be described as excellent here, though some of them are of exceptional merit, namely:—Belle Julie, Bergamotte Heimbouurg, Beurré des Béguines, Frédéric de Wurtemberg, Henkel d'Hiver, Maréchal de Cour, Nec Plus Meuris, Sinclair, Surpasse Meuris, and Thompson's.

As illustrating one method of improving Pears, namely, an elaborate system of selection, the plan adopted by Van Mons is interesting, though it has been to some extent superseded by quicker methods. Still, the results prove that a large measure of success attended his efforts.

The plan was based upon the belief that the tendency in cultivated Pears is for their seedlings to revert to a wild form, especially when the seed is from old trees, whereas seed gathered from a young tree of a good variety may produce seedlings of equal or even superior merit. He also considered that similar results followed when taking the seeds from old varieties, which were more likely to give unsatisfactory results than those from a variety of more recent production. Van Mons therefore raised seedlings from young trees of new and meritorious varieties, selecting the most promising of these, as regards habit, to grow on and produce fruit. From these again the best were selected and seed again sown, and this process was continued until the fifth generation (or sowing) was reached, the time required for the fruiting being reduced in each case until the fifth only required three years to produce fruit. When this stage was reached the best varieties were selected for increase by budding or grafting. As part of the system, which was directed to the reduction of the natural vegetative vigour of the seedlings, the fruits were gathered before they were ripe, and then allowed to decay before the seeds were taken from them. Further, the seedlings all had their tap-roots shortened, and were planted close together.

This is probably the most elaborate system of selective improvement that has ever been employed in horticulture, quicker methods being resorted to now. Still, the principle is suggestive, and is applicable to other fruits and plants, with a less expenditure of time. Downing has pointed out that the theory has had a certain amount of exemplification in the United States of America, because the earlier settlers took seeds there of some of the best old European varieties, the large majority of which proved worthless. But as time went on, and seed was sown from the best of these, there has been a gradual improvement, until numbers of excellent fruits of native origin have been produced in increasing numbers, without any further artificial aid than the continual selection of the most promising.

Another simpler and more expeditious method of improvement by selection is that in which the seedlings, when large enough, are budded or grafted upon a dwarfing or precocious stock, and treated generously to secure the early and full development of the fruit to enable the cultivator to judge whether it is worthy of preservation or not. The chief difficulties in this are

—1st, considerable labour is required; 2nd, large numbers have to be grafted which are ultimately discarded; and 3rd, a new Pear, when selected, frequently does not develop its full characters in its early stages, and in the course of a few years may prove to be either better or worse than it was at first thought to be. Practically this method is generally followed by the majority of raisers of new Pears (as well as of other fruits) both in Britain and elsewhere at the present time.

The third, and most scientifically promising system, is that of intercrossing the varieties whose characters it is desired to combine or improve, and the attention that is now being paid to this matter is likely to yield important results.

Thomas Andrew Knight was one of the first to commence the work in a systematic manner

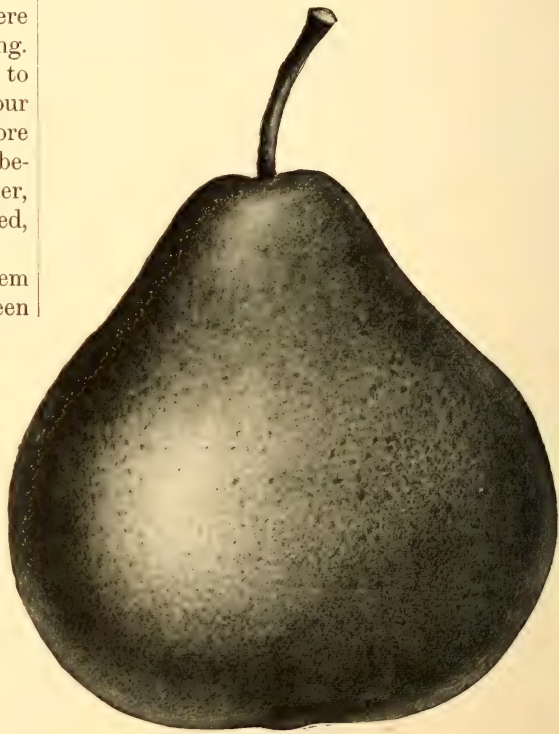


Fig. 898.—Pear. Monarch.

in England, but though a century has elapsed since he began his experiments in crossing Pears and other fruits, it is only within comparatively recent times that his work has been taken up in the same manner. Unfortunately few of Knight's Pears have withstood the test of time. Amongst these are Althorp Crasanne and Monarch (fig. 898), the latter Dr. Hogg considered to be the best of all the Knightian seedlings. It is

questionable if the others are in general cultivation now. Increasing attention is, however, being paid to this work, and the chief difficulty that has to be overcome is the maintenance of a good constitution in the product of the cross, while the quality of the fruit is improved, or the season varied. Many Pears of the highest quality are defective in habit, hardiness, or fertility, and in seeking to correct or reduce these defects there is a danger of inducing the other extreme, *i.e.* excessive vigour. There is ample room for improvement amongst Pears, although they are so numerous. With early Pears alone many good results might be obtained, while in the production of hardy fertile varieties of general commercial value there is a wide scope for experiments.

As an indication of what can be effected

by new work in the direction of intercrossing, the results obtained in the United States within the past few years are especially interesting. The official *Year-book of the Department of*

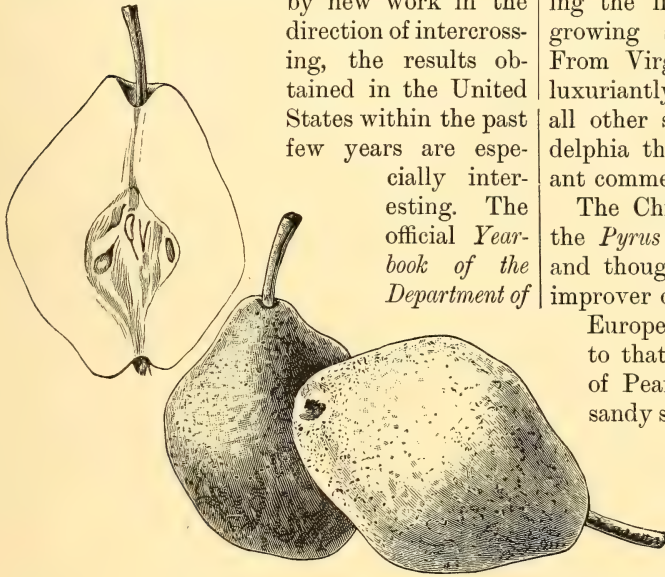


Fig. 899.—Kieffer Pear (after Bailey)

Agriculture for 1899 contains a report upon "Progress in Plant-breeding", in which the following passage occurs:—

"The Pear owes but little of its development to artificially produced hybrids, and yet in no other fruit have hybrids played such an important rôle. The Kieffer, Le Conte, and Garber, all widely-grown commercial Pears, through which this industry has been greatly extended, are naturally produced hybrids of the European Pear and the Chinese Sand Pear. The European Pear, noted for its excellent quality, succeeds admirably on the Pacific coast, but has never proved wholly satisfactory in the Eastern States, and cannot be successfully grown on a commercial scale south of Virginia. The Chinese Sand Pear

comes from a region having climatic conditions very similar to those of the Eastern and Southern States, and thus finds here a congenial home. The fruit is of poor quality, however, and the variety is grown only as an ornamental tree and for stocks on which to bud other sorts. The Kieffer and Le Conte are both seedlings of the Chinese Sand Pear, and from their characters show that the seeds from which they grew must have been accidentally crossed with the pollen of some good variety of the European Pear. It is probably to the father parent, the European Pear, that the improved quality of the fruit is due, while the vigour and adaptability to growth in warm climates evidently come from the mother parent, the Sand Pear. These hybrid sorts practically revolutionized Pear culture in the eastern United States, extending the limit of profitable commercial Pear-growing several hundred miles southward. From Virginia to Florida the varieties grow luxuriantly, and have practically driven out all other sorts. Even as far north as Philadelphia the Kieffer is by far the most important commercial variety."

The Chinese Sand Pear there mentioned is the *Pyrus sinensis* we have already referred to, and though not in itself very promising as an improver of the many fine Pears now grown in Europe, it is evident from the results referred to that the commercial value of a new race of Pears adapted to hot dry positions and sandy soils would be very great. The variety

Le Conte has, for instance, been extensively planted in the neighbourhood of New Orleans, and a consular report states that large shipments of this variety were commenced in 1894. Reports from California state that in quality the

fruit there is not equal to the European Pears. At the Hybrid Conference of the Royal Horticultural Society at Chiswick, in 1899, Professor L. H. Bailey of Cornell University, in the course of an interesting paper, had the following remarks:—"The European Pear does not thrive in our southern states. But a new race has made Pear-growing profitable there. This race is the product of several hybridizations of *Pyrus communis* and *Pyrus sinensis*. Of this race two varieties, the Kieffer (fig. 899) and Le Conte, are widely planted. The acres upon which they are planted are counted by the tens of thousands. The Kieffer is now the leader. It is a poor Pear in quality, but it is immensely productive, handsome, and a long

keeper, and it sells well in the open market. This mongrel race has made Pear-growing possible over an immense region. It must rank as one of the great hybrids of the world." Such a race could well be improved and adapted for many of our British colonies.

The Flavour of Pears.—As regards a large number of the distinct flavours of Pears, it is quite impossible to classify them; they differ from each other by delicate gradations like the odours of flowers. The musk-like flavour so characteristic of many varieties probably originated in the early periods of the Pear's development, a variety known in the time of the Romans being so distinguished. Some of the most marked types of this group in cultivation at the present time are the following:—Olivier de Serres, a well-known variety; Arlequin Musqué, very strongly flavoured; and the Œuf, which is also remarkably flavoured. With this may be classed the Ambrette d'Hiver, the flavour of which has been compared to the fragrance of the Sweet Sultan, and thence derives its French title; and Besi d'Héry, with the flavour of Muscat Grapes. Pears of rich aromatic odour form another large group. Prominent amongst them is the Seckle, one of the richest-flavoured varieties in cultivation, and for which we are indebted to the Americans. It is almost unique, but there are a few varieties that present some resemblance to it: such as some of the Rousselets, from which indeed it has been supposed that Seckle may have originated. Beurré des Béguines is another of the same class, and presents some resemblance to Seckle in its aroma. Varieties with almond-like flavour, such as Doyenné Sieulle, Leopold Riche, and Amande Double, form another group; whilst yet another may be formed of varieties possessing a wine-like flavour represented by Forelle, or the Trout Pear, which, in its best condition, has a peculiar richness. The aroma of Althorp Crasanne has been compared to rose-water. Ananas derives its name from the resemblance of its flavour to the Pine-apple. Salviati is the Ratafia Pear, and Franchipanne, which is suggestive of the perfume Frangipanni, derived from the Red Jessamine (*Plumeria*). The Jargonelle has a distinct flavour, and it forms one of the fruit essences which chemists have succeeded in imitating very closely by artificial products. Sir H. E. Roscoe says: "Amongst the compound amyl ethers the acetate is prepared on a large scale, as it possesses the peculiar odour of Jargonelle Pears, and it is used in flavouring cheap

confectionery. This compound is obtained by distilling amyl alcohol with potassium acetate and sulphuric acid; it can also be prepared by heating the chloride with potassium acetate."

Too much attention has been paid in recent years to the production of varieties with very large or handsome fruits, without due regard to the much more important quality of flavour. Because large finely-coloured fruits, and handsomely-formed Pears are readily sold in the markets, it does not follow that they will satisfy the owners of private gardens or connoisseurs generally.

No hardy fruit varies more in quality and flavour under different conditions of soil, situation, and climate than the pear, and this has been a prolific cause of divergences of opinion concerning the respective merits of well-known varieties. A remarkable, and indeed it may be termed an historical, example of this was afforded by the experience of the late Mr. R. D. Blackmore, who, besides being an eminent novelist, was also a pomologist of a keenly critical character. He formed a large collection of Pears in his garden at Teddington, in Middlesex, and when the late Dr. Hogg was preparing the last edition of his fruit manual he invited Mr. Blackmore to state his opinion concerning the principal varieties in general cultivation. The result was rather startling, as a sweeping condemnation was obtained of varieties which are found satisfactory in many of the best British gardens. Some of the most remarkable instances were afforded by Beurré d'Aremberg, Beurré Bercmanns, Beurré Bronze, Beurré Diel, Beurré de Jonghe, Beurré Langelier, Beurré Six, Catinka, Citron des Carmes, Colmar, Colmar d'Été, Comte de Lamy, Deux Sœurs, Dr. Nelis, Doyenné Boussoch, Durondeau, and Emile d'Heyst. These were variously stigmatized as "worthless", "much overrated", "flavourless", or of "uncertain cropping qualities". These remarks were added by Dr. Hogg to his descriptions, and have provoked much comment, but the object was to indicate how easy it is to misjudge an excellent fruit from a limited experience. If all Pears had failed with Mr. Blackmore the cause would have been traceable to the total unfitness of soil and situation for the culture of this fruit; but this was not the case, as is proved by the fact that some Pears succeeded there admirably, and received the highest commendation, such, for instance, as Doyenné du Comice. It is obvious, therefore, that there were conditions

very unfavourable to some varieties and not to others. They may have been quite local, for Pears are grown admirably in many parts of the Thames valley, though it is not an ideal situation for this fruit. This is only cited as a prominent example, showing that the cultivator is not always to blame for the failure of some Pears. There is always a degree of uncertainty as to the results when Pear-culture is commenced in a fresh district.

Pears for Ornamental Purposes.

—A well-grown Pear-tree in full blossom is an exceedingly beautiful object, as, though the individual flowers are less attractive than those of the Apple, the profusion with which they are produced, and the accompaniment of a few soft green leaves, render the general effect charming. Their period of beauty is brief, but so is that of many popular plants grown exclusively for their flowers, and there is a second period of attraction to anticipate, *i.e.* when the fruit is ripening. Admirers of flowering deciduous trees often include the Pear in ornamental plantations, and some will indeed go further, and form groups in a convenient portion of the flower-garden within sight of the house or favourite walks. Free-growing varieties of distinct habit and profuse flowering are especially useful for this purpose, such, for example, as the erect and stately Old Windsor Pear, or the somewhat pendulous Jargonelle.

Another mode of utilizing Pears for ornamental purposes is that of training them over light metal or wooden arches (fig. 900). The various forms of upright cordons are well adapted for this purpose, and if introduced at suitable positions, especially at the intersection of walks, the effect is pleasing. The trees are well exposed to light and air, and often prove exceptionally fruitful as well as ornamental. It is desirable, however, to avoid narrow arches, which have a very meagre appearance and only prove disappointing.

Variegation often appears in Pears, not only in the foliage, but also in the wood and the

fruit. Varieties which usually develop this peculiarity are Bergamotte Suisse, Beurré d'Amanlis Panachée, Duchesse d'Angoulême Panachée, and Louise Bonne d'Avranches Panachée.

General Culture: Essentials.—It has been said that wherever "the Apple thrives the Pear will



Fig. 900.—Arcade of Pears, Madresfield Court.

grow", and this is perfectly true as far as it goes; but it is not "growth" alone that we require, and unfortunately there are many places where Apples both thrive and fruit though the success of Pears in the same district is mainly confined to growth. The fact is, that there are many places in the United Kingdom where Pears are successful only when great care and skilful cultivation are devoted to them, and there are some where it is useless to plant them. This is a more serious matter in commercial plantations on a large scale than in private gardens, where various means are at

command to combat the evils arising from unfavourable conditions. But we have known Pears planted in quantities with a view to profit where various causes have combined to render them a dead loss, yet most of the unsuitable conditions might with due care have been detected before the risk was taken.

Districts for Pears.—There are districts in many of the southern and western counties of England where Pears are particularly successful, but it is occasionally difficult to distinguish between natural advantages and specially skilful cultivation. Kent is obviously a favoured county generally, yet in the neighbourhood of Maidstone, Sittingbourne, and Yalding exceptional results have been obtained, as, for example, at Barham Court, Mote Park, and Kenward as private establishments, and by Mr. A. J. Thomas and Messrs. Bunyard in commercial establishments, the former as a market-grower, the latter as a nurseryman. In Sussex the Uckfield, Horsham, and Crawley districts are well suited to Pears, especially the first-named, while Petworth has also contributed in no small degree to the production of fine Pears. In Surrey the fruit succeeds in many districts, but exceptional results are rare. Of the western counties, Hereford, Somerset, Worcester, and Dorset give the best general success; but there are districts in Devon, Cornwall, and Gloucester where the culture of this fruit might be extended with advantage. The eastern counties are not specially adapted for Pears, except in a few sheltered and warm situations; but in Essex good results are obtained in many places.

In the midland counties the principal successes with the fruit are scored in private gardens, under the most experienced men; generally, as regards the colder central districts, on heavy land, the fruit is not seen at its best. In Buckinghamshire, Hertfordshire, and Nottinghamshire, in some favoured localities with fertile soils, Pears are grown with considerable success. The fruit deteriorates in the northern counties of England and the eastern counties of Scotland from bush or standard trees, but with the aid of walls a considerable measure of success is secured even to the extreme north. In part of Wales, especially in the south, Pears are satisfactory, and an admirable example of what can be accomplished with pyramid trees is seen at Cardiff Castle. In Ireland also the climate is generally favourable, at least along the east coast from Antrim to Cork; and wherever the soil and local conditions are suitable, good fruits are obtained. In fact, Pear culture might be

profitably extended in several parts of Ireland, as, though the extreme humidity in the south is not favourable to the fullest development of flavour, yet as regards size much success could be obtained, and fine Pears have a material commercial value.

Situation.—Even in favourable localities the situation in regard to shelter, elevation, and aspect must be carefully considered. The Pear is hardy enough naturally, but the young foliage is produced very early in the season, and in its then delicate condition is perhaps more easily injured by wind than by any other cause. The flowers also expand at an early and critical time, and they are quite as liable to destruction by keen dry winds as by frost. We have seen the prospect of many fine crops ruined by winds that seemed to scorch and shrivel the petals and the essential organs. Shelter, then, is a consideration of the first importance, especially from north and east winds. Protection from south-west winds is equally essential, for the majority of Pears are more easily bruised and rendered practically useless than Apples, and when a heavy crop is ripening, exposure to one gale is sufficient to bring them all to the ground, or at least to materially reduce the value of the fruit. If there is no natural shelter either in the form of timber plantations, rising ground, or buildings, belts or hedges should be planted as indicated in the chapter on Apples. All such protection must be at a sufficient distance, to avoid soil exhaustion by the tree roots in the immediate neighbourhood of the Pears, and over-shading must be similarly guarded against.

Elevation is an item of importance amongst the conditions demanding attention. The dangers attending low situations have already been pointed out, and if these are serious in the case of the Apple they are still more so with regard to the Pear. Indeed, it is useless attempting to grow Pears in low positions subject to spring frosts, as, though the trees themselves may thrive and flower, a crop of fruit will seldom be secured. Still, it must be remembered that the requisite elevation is more relative than absolute, and that the more inland the position the higher the altitude must be to give a reasonable prospect of safety. (See chapter on APPLES.)

Aspect is important in reference to Pear culture, the best dessert varieties, especially the early and midseason sorts, requiring the fullest exposure to sunlight to perfect them. The Pear demands a higher temperature than the Apple to develop its finest qualities, and this is one reason why in France and Belgium many

sorts have gained favour that are of little use here. We cannot overcome all the difficulties of our climate, but much may be done by choosing an aspect that commands the fullest exposure to the sun, and this is still further aided by a moderate slope towards the south.

These remarks generally apply to plantations of bush, pyramid, or standard trees. In British gardens, however, a large portion of the wall space at command is devoted to Pears, and as we go north this proportion is increased, because they cannot be depended upon without such protection. Another advantage is, that by planting against walls with different aspects the season of some fine Pears can be prolonged, while even the north walls can be turned to account for the varieties employed for stewing, or for some of the latest keeping sorts that require a long period of gradual maturing. It is a rather strange fact, but not inconsistent with what has already been said respecting the variability of the Pear under different conditions, that some varieties develop much higher qualities when trained to walls than they do in the open, while others show the reverse behaviour. They are not constant even in this, as they may occasionally give better results as a wall fruit in the north than they do in the south.

Soil.—The most suitable soil for Pears generally is a mellow, fertile loam of moderate depth, and either naturally or artificially drained, as, though a dry soil is antagonistic to the welfare of the tree, yet excessive moisture in a stagnant state is productive of serious evils. As regards the richness and mechanical condition of the soil, the special fitness for Pears will depend to some extent upon the stock on which they are growing. If Pears on the free stock are planted on a deep, rich soil, an excessive and unfruitful luxuriance will result, necessitating considerable labour to check it, and often leading to disease. On the other hand, the Quince stock will usually thrive in such a soil, and produce healthy, fertile trees. The Quince is a bad stock upon poor, thin soils, the natural vigour of the free stock being required to support the trees under such circumstances. It is, however, a much more easy task to ameliorate an unfavourable soil, and adapt it to the needs of the Pear, than it is to alter other conditions that may be adverse to the well-being of the tree. If dwarf bush or pyramid trees on the Quince are to be planted, or trained trees on the same stock, a thorough preparation by digging or trenching should precede the planting, incorporating a good pro-

portion of old stable or farmyard manure where the soil is poor, or if it has been exhausted by previous cropping. It is better to expend a little time in this preliminary work than to rely upon removing defects subsequently, as it can seldom be then performed in a thorough or satisfactory manner. When soil abounds in chalk or lime and is at the same time deficient in humus, this liberal preparation is even more important, or the trees soon become sickly. We have seen instances where efforts to supply the lacking nourishment by means of top-dressings, or even by generous applications of liquid manures, have absolutely failed to accomplish the desired purpose, the only remedy being lifting and replanting the trees in freshly-prepared borders. With very heavy clay soils (which are naturally the least suited for Pears) no more effective means can be adopted than partially burning a portion and mixing this with the bulk at the time of digging, though abundance of decaying vegetable matter will also assist the work greatly. A rough digging in early autumn and exposure to a winter's frost and weathering will reduce some of the most tenacious soils to workable condition, and they can be then more readily prepared for early planting the next season. In most gardens where the whole of the available space is under a regular system of cropping and liberal cultivation, it is seldom that much special preparation is requisite for Pears. But where a plantation is being formed on fresh ground, or a border near a wall is to be planted, the conditions are very different, and greater attention is demanded.

Stocks for Pears.—The same broad distinctions rule in the stocks used for Pears as in those employed for Apples, namely, the seedling Pear or free stock is that on which the largest trees are obtained either as standards or pyramids, with a correspondingly tardy arrival at a fruit-bearing stage. The Quince stock usually reduces the luxuriant growth of the trees and promotes early fertility. The Pear stock is often spoken of as if it were derived exclusively from seed of the Wild Pear, whereas it is seldom obtained from this source, and large quantities of Pear seeds or Pear seedlings are exported from France to Great Britain and the United States, practically furnishing the bulk of the free stocks employed here and in America. These seeds are obtained from various sources, and the resulting seedlings often exhibit marked differences in strength and habit, in the same way as do the free stocks for Apples (seedlings),

and to this may be attributed some of the variations in the behaviour and quality of well-known Pears, where the peculiarities cannot be otherwise accounted for. It is regrettable that a more exact and systematic method of securing free Pear stocks is not generally adopted, so that the results could be equalized to some extent. However, this is not of so much importance with the free stocks as with the

dwarfing stocks, because a much larger proportion of the latter are now employed both in our own nurseries and in other countries. Several different forms of Quince have been, and still are, used as stocks, such as the Common, the Portugal, the Angers, with others, and very different opinions have been expressed regarding their respective merits. The Portugal and the Angers varieties are, however, the



Fig. 901.—Pear. Pitmaston Duchess on Pear Stock
(10 feet high, 6 years old).

Fig. 902.—Pear. Same variety and same age on Quince Stock.

(These figures illustrate nearly equal growth on the two stocks.)

principal favourites; the first being of free and vigorous growth, but it is not very fertile and is rather difficult to raise in quantity. The Angers variety, on the contrary, is not so strong, but it is compact in habit, very prolific, and comparatively easy to increase, points which have recommended it to nurserymen in Britain, America, and on the Continent. The chief objection against it is that the growth does not always keep pace with that of the scions of the stronger Pears, with the result that the life of the tree is shortened and there is more danger of damage resulting in stormy weather. This partly depends, no doubt, upon the

method by which the stocks are propagated and grown previous to budding. Much more strongly-rooted and freely-developed Quinces are usually obtained from layers than from cuttings, but the process does not admit of such rapid increase, and in consequence large numbers of Quince stocks are raised from cuttings for trade purposes. If these are carefully selected and well furnished with roots they are as good as the others; but this has not always been done, and in consequence a doubt has been cast upon the durability of a very useful stock. It has been said that the sparse-fruited character of the Portugal Quince affects the behaviour of

the variety employed as the bud or scion, but we have never observed an instance of a Pear that is naturally of a fertile habit being thus affected. Still, we prefer the Angers type for the reasons already given.

There is no question that the general introduction to gardens of the dwarf-bush or pyramid pears on the Quince stock, which was largely due to Mr. Thomas Rivers, has con-

tributed greatly to the increased popularity of the Pear for general cultivation. In four or five years fruitful trees can be grown, whereas on the free stock they would not be productive for at least double the time. Then, too, in many cases better coloured and more highly flavoured fruits are secured from trees on this stock than from those on the Pear, which is apt to induce coarseness of the flesh until the tree is well established and bearing freely. The objection that trees on the Quince would be of short duration has not proved to be the fact, unless in exceptional cases where the stock has been defective from the start.

Intermediate Stocks—Double-grafting.—Though all Pears will grow on the free stock, there are some which will not thrive when placed direct upon the Quince, and this led to the introduc-



Fig. 903.—Pear. *Emile d'Heyst* on Pear Stock
(9 feet high, 6 years old).



Fig.—904. Pear. Same variety on Quince Stock
(6 feet high, 6 years old).

(These figures illustrate greatly divergent growth on the two stocks.)

tion of intermediate stocks or double-grafting, one of the most interesting and important matters connected with the artificial increase of hardy fruits. The principle upon which this depends is that a Pear which grows freely upon the Quince is budded or grafted on that stock and allowed to grow for at least two years, this is then cut back to within a few inches of the Quince stem, and the variety it is desired to have on the Quince roots is grafted upon the intermediate stock. It is remarkable what a difference is effected in the behaviour of the fruiting tree by the introduction of this piece of stem of another variety; handsome, fertile trees are obtained of sorts that had hitherto been unsatisfactory in all

respects except on the free stocks. Many varieties have been employed as intermediates which were most suited to special varieties, including the following:—*Beurré d'Amanlis*, which forms a strong tree on the Quince, suits many Pears as an intermediate stock, especially *Jargonelle*, *Gansel's Bergamot*, and several of the *Bergamot* type. *Beurré Hardy* is another of free growth on the Quince, and most of the stronger Pears succeed upon it. In France *Belle de Berri*, known in Britain as *Vicar of Winkfield*, is largely used. It has also been employed in some English nurseries, *Beurré Clairgeau* being especially successful upon it. Other varieties that have given good results for a similar purpose are *Jaminiette*, *Sucr  Vert*,

Duc de Nemours, and Napoléon Savinien, which naturally form vigorous trees. Bési Goubault is another particularly hardy variety which

have been tried; while several Continental cultivators have grafted Pears on Apple stocks with some degree of success, though not sufficient to warrant the recommendation of the experiment for general purposes.

Forms of Trees.—The various natural forms of trees suitable for Apples are also adopted for Pears, but the latter lend themselves more readily to artificial training, and many modes are in use, some of which are more fantastic than beautiful or useful. As a standard on the free stock the Pear makes a very large and long-lived tree, indeed there are specimens still in existence in various parts of Europe that must rank with the oldest of our deciduous trees. When standards are well established and in full bearing they produce enormous crops of fruit during a long period, and though the fruit may be small, they often prove very profitable to their owners. But there is such a long time of waiting for these results that



Fig. 905.—Pear, double-grafted on Quince Stock, showing the intermediate stock.

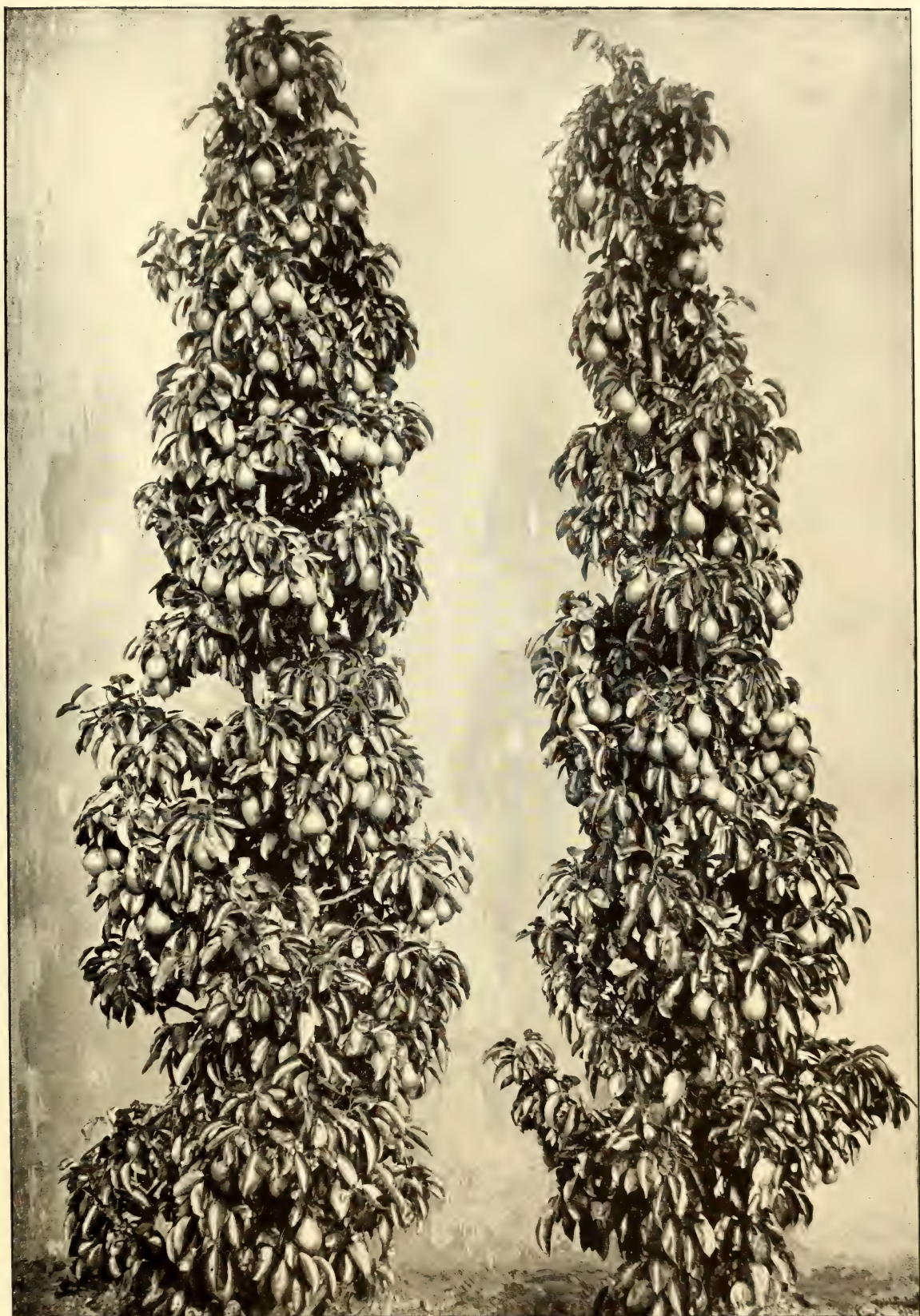
thrives on the Quince and suits the Jargonelle and Bergamot types. Prince Albert, a Pear of little value in itself, except for its free vigorous habit of growth, has been found well adapted for Marie Louise, Knight's Monarch, with Huyshe's Victoria and Princess of Wales. Marie Louise d'Uccle is extremely vigorous and prolific on the Quince, making a good intermediate stock for Marie Louise, and is also suited for Souvenir du Congrès and Beacon. Beurré Sterckmann is used for Joséphine de Malines, and Bergamotte Esperen for Beurré Rance. That fine old Pear, Brown Beurré, which is satisfactory both on Quince and free stocks, makes a good intermediate for Winter Nelis. For the latter Pitmas-ton Duchess has also been employed, while this in turn has been worked on Winter Nelis as an intermediate.

Other stocks have been used for Pears, but they possess little value, for instance *Crataegus Oxyacantha*, *C. Crus-Galli*, and *Cotoneaster affinis*



Fig. 906.—Pyramidal Pear.

the old saying, "He who plants Pears plants for his heirs", fairly expresses the general experience. However, in the formation of orchards



PEAR: BEURRÉ SUPERFIN
COLUMNAR TREES

standards or half-standards (which is a preferable form where the trees are not exposed to injuries by cattle) are necessary, and the principal means of avoiding excessive luxuriance and a prolonged period of development is to consider the soil before planting. In rich soil magnificent trees will be obtained, but fruiting will be delayed in proportion to the rapidity of growth; in comparatively poor soil or on chalk there is a prospect that crops may be obtained within a reasonable time. It is desirable that all orchards of Pear-trees on the free stock should be in grass after they are established, for this exerts an additional check on the vigour (see Plate). In cultivated land the trees are encouraged to increased growth, unless a close system of intermediate cropping with vegetables is adopted, which necessitates frequent digging, thus performing a kind of rough root-pruning.

By far the most useful form of Pear-trees for general purposes, either in private gardens or commercial plantations, are the bush and pyramid, to the latter of which the natural habit of the tree is most suited (fig. 906, and Plate). Upon the free stock large and vigorous pyramidal specimens can be had, and with due care in root-pruning a moderately early fertility can be induced provided the soil and other conditions be favourable. Handsome, well-proportioned, healthy, and prolific trees in this form are both profitable and attractive, and they are worth the trouble they demand, at least as a part of a plantation. Upon the Quince, however, either single or double grafted, we obtain the most serviceable trees for the majority of gardens, and wherever fruit is required as quickly as possible after planting, such trees are indispensable. The most vigorous varieties are moderated in their strength on this stock, and in the early years of the tree's life the difference between those of the same variety on the two classes of stocks is as marked in the flowering and fruiting as it is in the growth. In either of the two principal forms, *i.e.* bush and pyramid, excellent trees can be had on Quince roots of all the best varieties now that double-grafting has removed the difficulty that at one time rendered it impossible to purchase or raise useful Pears of certain varieties on the dwarfing stock.

A modification of the pyramidal form is the columnar or cylindrical (fig. 907), which is grown of nearly equal width from the base to the apex of the tree. It is convenient for planting where space is limited, but it has not much to

recommend it in other respects, and is certainly not so handsome as a well-grown pyramidal or conical tree.

In the artificial and more exact systems of training, the espalier with its various forms is



Fig. 907.—Columnar Pear in Flower.

well adapted for the Pear, as it allows more freedom of extension than some of the others. The horizontal espalier, in which the lateral branches start on each side of the main stem at right angles, *i.e.* horizontally, in successive tiers, until the requisite height is reached, is that in most general use. The position of the branches tends to check excessive growth, and the tree

is especially suited either for training to trellises or walls. The vertical espalier forms a good tree, but is best adapted for the weaker-growing varieties. This is sometimes termed the "grid-iron" form of training, the branches rising vertically from the main stem trained horizontally to the right and left. The individual branches may then be regarded as similar

to and requiring the same kind of treatment as vertical cordons.

The Palmette Verrier (fig. 908) may be considered an extension of the last-named systems of training, and under that method handsome and useful trees can be formed, especially against walls. The lower branches are trained horizontally to the full extent of the lateral space to be

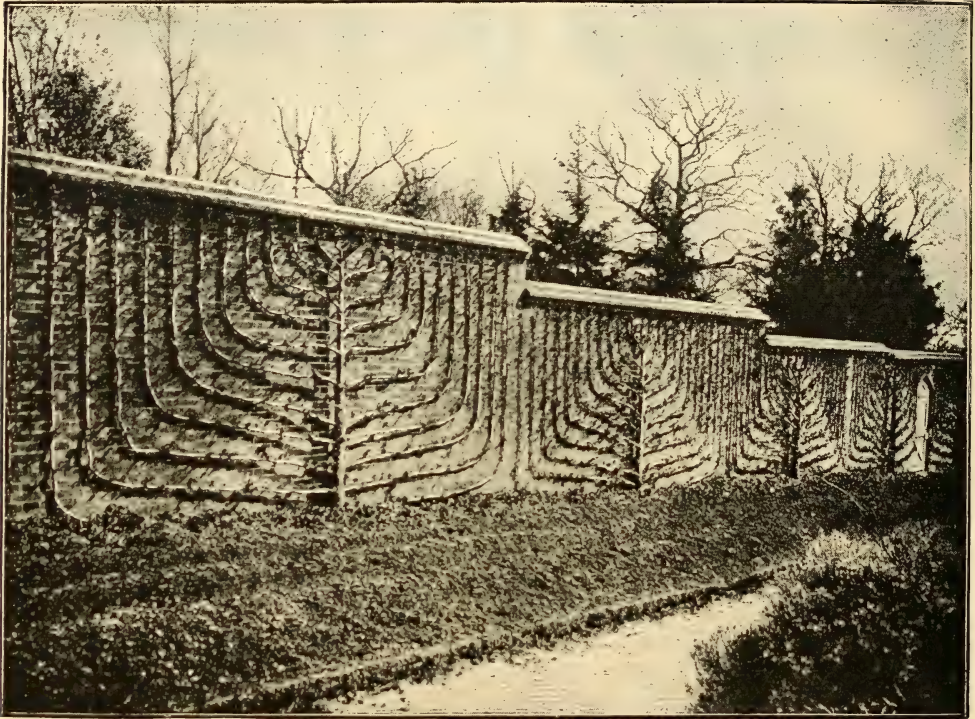


Fig. 908.—Palmette Verrier Pear-trees.

allowed to the tree, and then turned up at right angles, thus completing their growth in the same style as the vertical cordon stems. Each successive pair of branches is treated in the same way, at the allowed distance within the others, the whole tree when fully developed thus having a square outline. Mr. E. Luckhurst adopted this method of training Pear-trees in Sussex with great success, and the trees for a number of years have proved highly satisfactory. The wall space is occupied in a very economical manner, and the check caused by the sharp angle at which the branches are turned prevents undue luxuriance of growth and promotes fertility.

Cordon training (figs. 909, 910), either in the horizontal, vertical, or oblique forms, is adapted for the Pear on trellises or walls, and handsome fruits can be had from such trees under the best treatment. A considerable portion of the finest

exhibition fruits which appear at the leading shows are produced by cordon trees in favourable situations. The horizontal cordons, either single or double, are best fitted for marginal borders near paths, but most of the other forms are well adapted for walls or trellises, and permit a number of varieties to be grown in a moderate space, thus obtaining a long succession if that is desired.

Few other forms of training for Pears are adopted in Britain, but in France some very elaborate trees are produced with the expenditure of much time and care. Some of these are formed by the approach grafting of the branches of neighbouring espaliers, so that various geometrical designs are produced. Others are formed by the adjoining branches of the same tree being looped and intergrafted to produce vase or balloon-shaped specimens that are attractive as curious examples of the

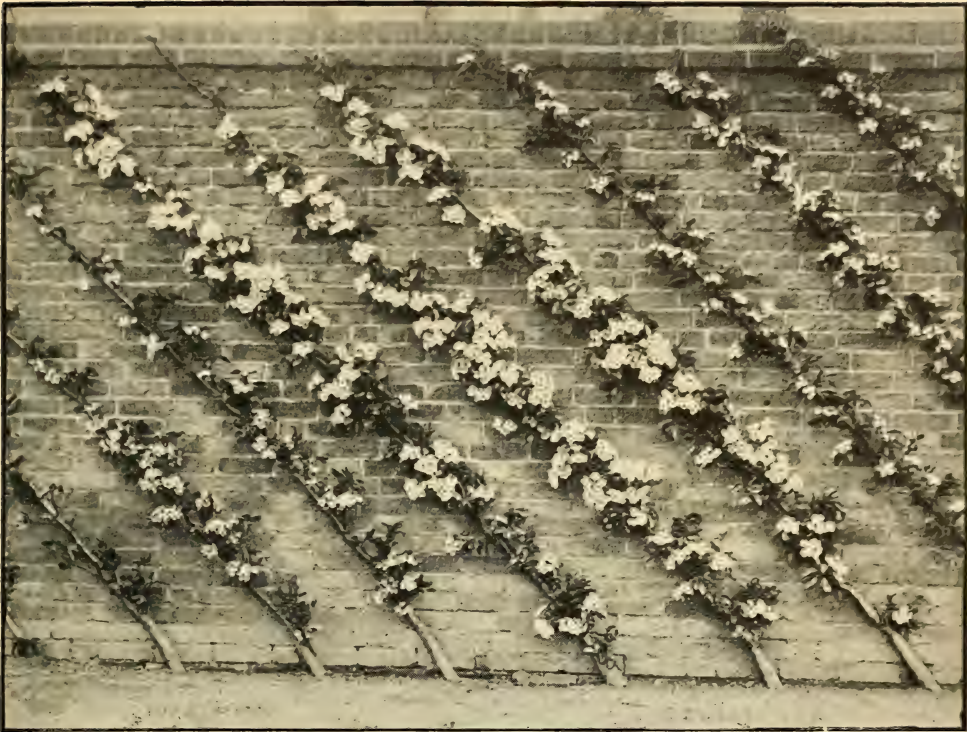


Fig. 909.—Cordon Pears in Flower.

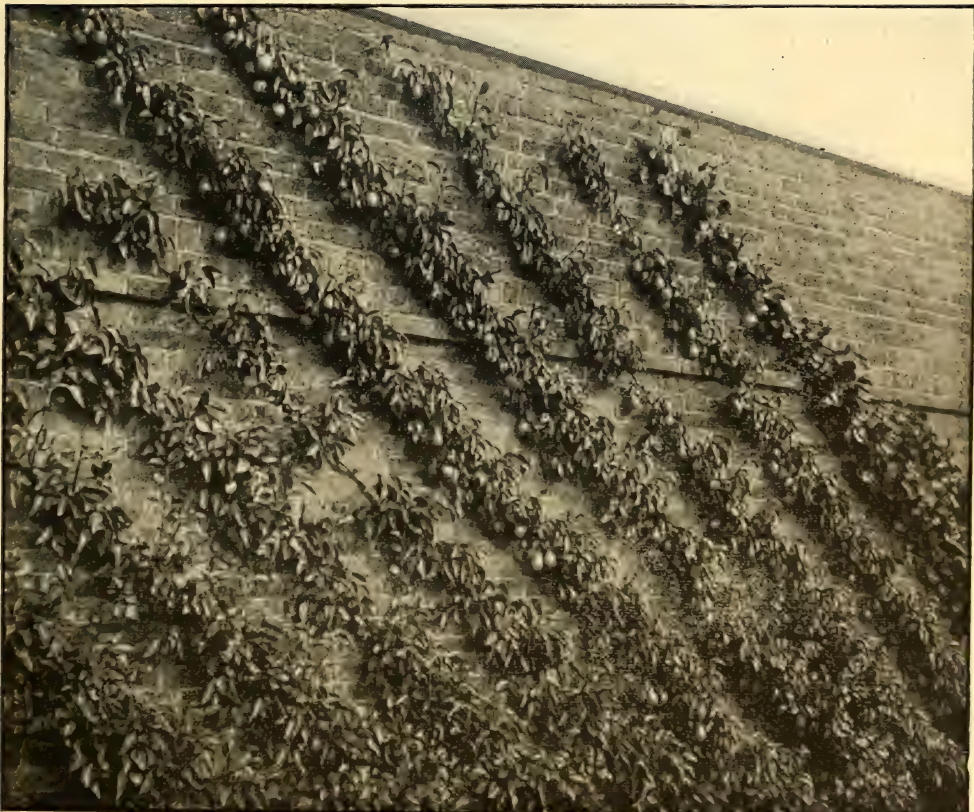


Fig. 910.—Cordon Pears.

gardener's art, but which serve no other purpose. Mr. W. Robinson has given some good illustrations of the more remarkable of these in his *Parks and Gardens of Paris*.

Training single cordons or some similar form across each other at an angle, leaving diamond-shaped interspaces, has been advocated as a means of forming Pear-hedges that might be both useful and ornamental, but the same purpose can be more readily accomplished in another way. This is by planting maiden trees, of varieties that grow freely on the Quince, about 2 feet apart, cutting them back and pruning for the first two or three years, when they can be treated in the same way as an ordinary hedge. Some reduction of the growth in the summer is, however, desirable. Free-flowering and fairly compact varieties should be selected, as their appearance is the chief object, though the fruit produced will prove useful in some seasons. One mode of utilizing the Pear need only be mentioned here, as it is referred to at length in another chapter, namely growing the trees as pyramids or bushes in pots in orchard-houses. Where early supplies of fine Pears are required, or in districts where soil and climate are unfavourable to obtaining the fruit in perfection out of doors, this is a most valuable addition to the resources of a garden. The trees also possess much ornamental value in flower and fruit.

Arrangement and Distances.—If plantations of Pears are to be formed, the methods of arrangement suitable for Apples and orchards, of which details are given in their respective chapters, are also applicable. But it is seldom that such are formed wholly of this fruit; they more frequently constitute part of mixed plantations, or are employed as lines or avenues in kitchen-gardens. All Pears on the free stock require a liberal allowance of space, and for orchard standards 30 feet in each direction should at least be allowed. Pyramidal Pears on the same stock should be 15 to 20 feet apart for all the stronger-growing varieties if they are intended to remain where they are planted without thinning. In the columnar style (fig. 911A) 6 to 10 feet will suffice. Either bushes or pyramids on the Quince seldom require more than 10 or 12 feet, and the weaker growing varieties will succeed for some years at less than that if necessary. But crowding Pears in any form is very undesirable, if it can be avoided.

As regards trained trees for trellises or walls, much will depend upon the height of the support to which the trees are secured. If these

do not exceed 8 feet in height, allowance must be made for more lateral extension in the case of all forms of espaliers than where the walls are 10 feet or more high. In the same way the oblique cordons are more fitted for low walls and trellises than the vertical cordons, which demand a greater extent to develop in an

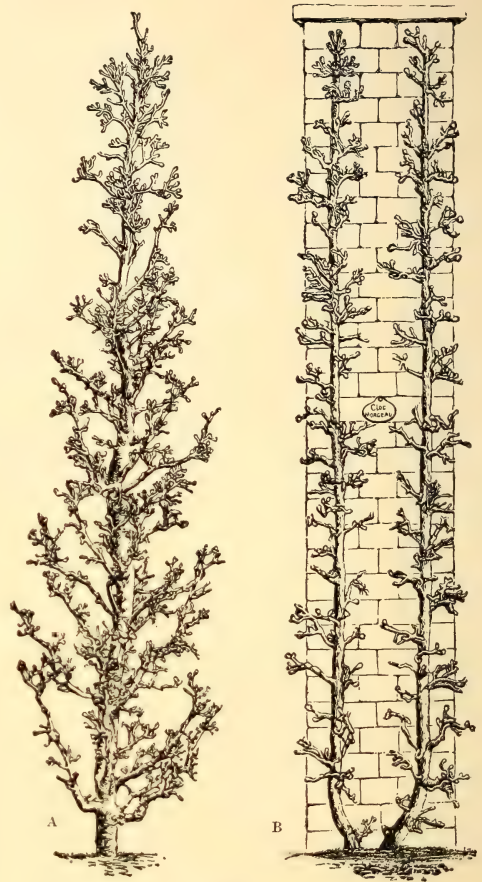


Fig. 911.—A, Columnar. B, Double Cordon.

upward direction. For espaliers on walls and trellises, from 15 to 24 feet apart may be allowed, according to the habit of the variety, the space at command, or the demands upon the garden resources. Single horizontal cordons may be allowed from 8 to 10 feet, and double cordons of the same type from 12 to 20 feet. Vertical or oblique cordons will require a distance of from $1\frac{1}{2}$ to 2 feet for each stem; thus, double cordons (fig. 911B) should be at least 3 feet apart, and triple cordons about 5 feet asunder.

Planting.—The directions given respecting the condition of the soil, with the time and method of planting for the Apple, are equally appropriate to the Pear; but this tree starts so early in the spring to produce flowers and

foliage that planting cannot be safely deferred so late as with the Apple. Much depends upon the character of the season and the state of the tree; in moist, warm, and cloudy times late planting can be often safely performed. Mr. T. Rivers has stated that "Pear-trees on the Quince stock offer a curious anomaly, for if they are removed quite late in the spring—say towards the end of March, when their blossom-buds are just on the point of bursting—they will bear a fine and often an abundant crop of fruit the same season. This is perhaps owing to the blossoms being retarded, and thus escaping the spring frosts; but it has so often occurred when no frosts have visited us that I notice it, in fact no trees bear late removal so well as Pears on Quince stocks." If this is taken in conjunction with what has been said about weather conditions, it may be relied upon; but it is not an advisable proceeding to transplant Pears when starting to grow if the characteristic March conditions prevail, *i.e.* drying winds and hot sun.

Deep planting is bad for Pears, especially those on the free stock. Where the soil conditions are very unfavourable, planting on the surface has been adopted, mounding the roots over with soil. There is a danger in this when very dry seasons follow, as what little rain may fall runs off without penetrating to the roots, and it thus sometimes happens that even in a damp position the trees may suffer through receiving an insufficient supply of water at a critical time. This may be overcome in some measure by ridging the soil on each side of the tree, at the limit of the roots, thus forming a trough-like receptacle.

Pears on the Quince should be planted so that the stock can be covered with soil, unless that is unusually long. Roots are then often formed up to the juncture with the scion, thus strengthening the tree materially. When the stock has not developed in something like the same proportion as the scion, the point of union is always the weak part of the tree, and a source of danger in stormy weather. For this reason careful staking is essential for most bush or pyramid Pears on the Quince, and the stakes cannot be safely dispensed with for some years unless the trees are sheltered or make exceptional progress.

In planting against a wall, it is important to cover it as quickly as possible, consistent with allowing the trees sufficient room. At wide distances trees trained horizontally will reach the top of the wall as soon as others that are

planted more closely together, but for many years there will be larger spaces uncovered between those that are widely planted, as will be readily understood on referring to fig. 912. Supposing that the wall is 13 feet high, and

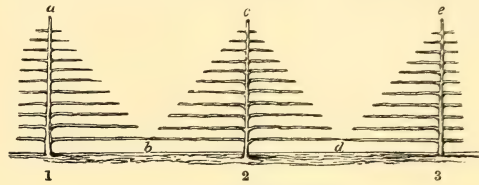


Fig. 912.—Horizontal Training.

that the upright is annually stopped so that one course of horizontals will be made in a year, then in twelve years, the horizontals being 1 foot apart, the leader will reach the top of the wall. Presuming that at the expiration of this period the lower horizontals of the trees 1 and 2 meet, it is then evident that only half of the wall will be covered; for the space covered by the side of the tree No. 1, and that covered by the side of the tree No. 3, are together equal to the unoccupied space *abc*; whilst the space covered by the tree No. 2 is equal to the other unoccupied space *cde*. In short, it is easy to observe that the covered spaces form four triangles, and that the uncovered spaces form four similar triangles equal to the former, so that half the wall is covered, and half not.

Supposing the trees had been planted at half the distance apart, as in fig. 913, also that they

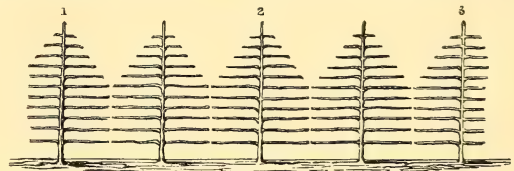


Fig. 913.—Horizontal Training.

had grown at the same rate as fig. 912, and accordingly reached the top of the wall in twelve years, it will be observed that at the end of that period all the horizontals, from the base as far as half the height of the wall, will have met. The lower half of the wall is therefore entirely covered, and there is only one-fourth of the surface uncovered. If we calculate the difference in regard to time, we shall find that by planting at half the distance as much surface will be covered in three years as will be the case in four years by the other plan. Now, as walls are expensive, it is desirable that the whole available space should be utilized. Close planting, as above shown,

will contribute to that object, and the question is to what extent this may be carried as regards the Pear. In time Pear-trees in good soil will profitably occupy a wall of ordinary height if planted at 30 feet apart; but at such a wide distance there must be a large space of bare wall for many years. The greatest distance that need be allowed between the trees is 24 feet; but less than this would appropriate the space more rapidly.

When wall-trees were badly managed, when by close planting the branches had to be much shortened to keep them within the prescribed limits, and when in consequence of this shortening a mass of shoots sprung up, one of two things usually happened: these shoots were either allowed to grow during summer and cut closely off in winter, entirely wasting so much of the strength of the tree; or they were cut down near to their bases with the view of forming spurs at the portions left, but instead of spurs fresh shoots were usually produced. With such management, close planting was certainly not to be recommended, because it induced growths which, without due care, became an evil. But now it is different; for, by judicious summer pruning, trees can be kept in very small compass; thus, pyramidal-trained Pear-trees can be kept within a space not exceeding 4 or 5 feet in diameter. By employing similar means, a horizontal-trained tree might have its branches limited to an extent of 10 feet. This we know to be possible; but it is not always desirable, and to do it properly would require more strict attention than could, in many cases, be given. We would therefore recommend not less than 15 feet as the minimum distance which should be adopted, and 20 feet as the maximum. If the soil is very rich, 20 feet is a proper distance, and where but moderately so, 18 feet will suffice. It may indeed be said that 24 feet, with "riders" between, would be preferable; but these are not much to be depended upon for fruit, though they answer the purpose of covering the wall; moreover, by the time they are in a good bearing state, they have to be cut away to make room for the permanent trees. The distance to be allowed between these has therefore been considered irrespective of "riders".

Pruning and Training.—The stems of standard Pear-trees should be reared according to the directions already given in treating of the Apple. Three shoots are obtained at the proper height for constituting three main limbs, and each of these should be cut so that two shoots

may start at from 9 inches to 1 foot from its base; thus, as in the case of the Apple-tree, six main branches will be produced, a number which will be quite sufficient. For several years all shoots that start from the principal branches should be kept subordinate, until the latter have diverged so far as to afford an abundance of space for an intermediate branch. Where space allows of a greater number of branches being originated, they may be produced at any place by cutting back to suitable buds at that point. It has been explained that three buds will usually start immediately below the section; but in the case of open standards and dwarfs, three branches, with the exception of the three main limbs, should never take their origin from the same point, or at least from three contiguous buds. There ought to be no tridents in the tops of trees so trained, and one of the three growths should either be cut closely off, or shortened and managed so as to form a spur.

When subsidiary branches are encouraged from each of the six main limbs, it is desirable that they should proceed alternately from opposite sides, for when this is the case it will better resist the wind. If each of the six main branches be well balanced by having as many growths on one side as on the other, possessing the same vigour, and further, if equality is maintained between the six principal branches themselves, the tree may be considered to be properly managed.

Whilst encouraging the principal branches, by taking care to check vigorous shoots that otherwise would become competitors, nakedness should at the same time be guarded against. Some varieties are naturally disposed to branch, but others are apt to produce shoots that are bare for nearly their whole length. These, then, require to be shortened, in order that shoots to form branchlets and spurs may be produced. When the top of the tree becomes large, the spurs on the bases of the large limbs will be apt to die, from their foliage not having so full a share of light as those on the outside. This can be prevented to some extent by keeping the branches on the south side thinner than elsewhere, in order to admit the sun's rays more freely into the interior.

After the heads of standard trees have been kept regulated for several years, as above directed, the tree will generally have to be left to follow its natural mode of growth. Yet all gross irregularities should be prevented:

branches must not be allowed to cross each other, and shoots that are taking a wrong direction ought to be cut out. When the tree arrives at a bearing state, branches loaded with fruit will be more or less weighed down; and when a branch is bent during any considerable portion of the growing season, by fruit or any other weight, it retains nearly that form after the weight has been removed. Hence, in full-grown trees, the extremities of the branches are generally turned downwards, a direction unfavourable for the prolongation of shoots, but conducive to the formation of fruit-spurs. In old standard trees, it will be observed that the fruit is chiefly produced at and near the extremities, and there of course it is best situated for light and air. Not unfrequently, however, when the tree is in this condition, vigorous upright shoots push from strong branches in the interior of the head of the tree. These are injurious, for they appropriate the sap that would otherwise contribute to the nourishment of the fruit-spurs at the extremities. The sap will rush into these vigorous shoots as it would into suckers, and the more vigorous they become the weaker are those situated in the older parts. All upright shoots in the centre of the tree should therefore be cut off, or treated so as to form a spur.

Fig. 914 represents a small branch, which has been pruned at *b* above the two spurs *e* and *f*; of the two terminal shoots *c* and *a*, *c* having become too strong is stopped at *d*, *a* is left in order to give vent to the sap which would otherwise have flowed back on the spurs *e* and *f*, and caused them to be abortive. When danger of this is over the branch is cut off at *g*.

Instead of forming a head from six equally diverging branches, some prefer the pyramidal form, which certain varieties naturally assume. The upright

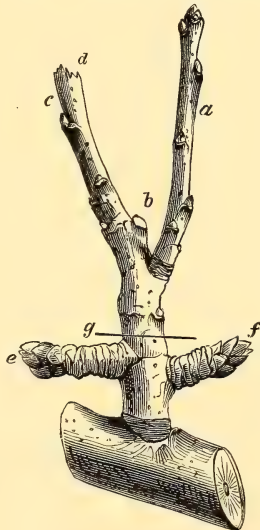


Fig. 914.—Pinching and Spur-pruning.

shoot ought to be encouraged, so that the head of the tree may consist of a central stem with branches proceeding from it. These branches should be kept on an equality, so that the top may be equally balanced.

Pyramid Training.

—As regards the form (fig. 915), the main object to be kept in view is a perpendicular stem, with every branch proceeding from it shorter in a horizontal direction than the one below it.

In proceeding to details, it will be best to commence with a maiden tree, which we shall suppose to be planted in November, either in the nursery or where it is to remain. The stem



Fig. 915.—Pyramid Training.

should be topped a little, but not cut so far back as to make the buds start near the ground. Next autumn let the stem be cut back near to the place where it was budded or grafted. If the tree has been well planted, and has made a fair quantity of leaves and roots in the course of the summer, a strong shoot will start from the base, which should be trained as upright as possible. In November cut it back to about 1 foot from the ground, and below this several shoots will start: the uppermost should be trained in a perpendicular direction for a continuation of the central stem, whilst the others will form the lower tier of branches. These may be allowed to grow without restraint till September, and then they ought to be all bent to nearly a horizontal position. But some may be weak and others strong: the latter must be most depressed, whilst the former should be allowed to retain their natural position till they acquire sufficient strength to be bent down in the following summer; but if likely to interfere with the young shoots above them, they must be trained so as to keep clear of these.

In the end of November any laterals that may have been produced on the branches of the lower tier should be cut to within 1 inch of their bases. At the same time the upright leader must be cut 15 inches higher than in the preceding season, if the soil is very rich and the climate moist; otherwise, only 1 foot higher, more especially if the variety is not a strong-growing one. This will cause shoots to be produced for another tier of branches. By these means the two lower tiers will have been obtained, and in the same manner as many more as may be desirable can be secured.

Instead of obtaining only one stage of horizontals annually, two may very well be produced after the first two, if the trees are growing well. It is advisable to originate the two lower stages from buds on the mature shoot as above directed, for it is important that they should be well established; but afterwards the upright leading shoot may have its growing point pinched off in summer when it has grown to the height of 12 inches. This will occasion the production of several shoots at or near that height, one of which should be trained to grow upright during the remainder of the season, and afterwards be cut over at 12 inches above where it was pinched, that is, at 2 feet from where it started in spring.

Having pointed out the manner in which the stem is reared, and the mode of originating the side branches, we shall now turn to the management of the latter. They should be pruned and trained with an aim to give the tree the form of a pyramid or cone, of which, if the tree is intended to be of limited extent, fig. 916 may represent a section. Its total height is about equal to its circumference at the widest part, a proportion which is considered to give the most elegant appearance. If the distance from the base *b* to the apex *a* be 10 feet, the circumference at the widest being as much, the diameter at *d* will be about 38 inches. The branches must therefore be kept within the limits *ac* and *ad*. The upper branches will be strongly disposed to extend, not only beyond the limits represented by the dotted lines, but also much beyond the horizontal extension of the lower branches. This must, however, be prevented

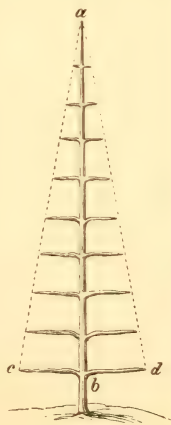


Fig. 916.
Pyramid Training.

by an early stopping of the shoots. In summer, as well as at the winter pruning, the regular outline of the tree must be kept in view and strictly maintained, otherwise the growth of the top will soon be in a condition to draw the greatest share of the sap, which is unfavourable to fruitfulness. If all the branches were of equal length the tree would be like a cylinder, but they would be equal as regards their length and that only, for their vigour would be very different, vegetation being much more active in the upper than in the lower part. When subjected to pyramidal training, the upper branches are shortened so that the quantity of foliage they bear is less than the lower ones do; and thus the supply of sap will be limited in the part where, otherwise, it would tend to be in excess.

The above remarks will be sufficient to show the necessity of strictly preserving the outline; but all within will be a mass of shoots unless attention is paid to pinching and summer pruning, for on these the success of trees trained as pyramids chiefly depends.

Summer Pruning and Pinching the Shoots.—It is evident that if the shoots of a pyramidally-trained tree were not shortened and thinned, their foliage would suffer from being shaded and crowded. It is also certain that if the laterals were allowed to grow till the winter pruning, they would either have to be cut off, or, if then shortened, a number of shoots would start from their bases, and cause greater crowding in the following season than before. Such being the consequence of cutting back shoots at the winter pruning, in order that little winter pruning may be necessary, recourse must be had to summer pruning, an important operation, respecting which, however, there is much diversity of opinion. We shall consider it in detail, both as regards the parts to be operated on, and the time and manner of performing the operation.

A pyramid-trained tree consists, essentially, of an upright stem, and as many side branches as can be properly trained without overcrowding. There must be space between them for fruit-spurs when these come to be formed. All shoots not required to form the stem or the branches from it must be summer-pruned, either by the knife, or by pinching between the finger and thumb. The operation should be performed on laterals that grow from the young summer shoots that are intended to form a permanent part of the tree, as well as on those of the older wood. The time varies with the earliness or lateness of the season; and again, as a general rule, the

operation should be performed sooner upon the upper and more vigorous parts of the tree than upon the lower and less vigorous portions.

Allow the lateral shoots to form six leaves, and then pinch them immediately the sixth leaf is formed. There are usually latent or only partially developed buds at the base of the shoot, with occasionally some small imperfect leaves, but in counting the six leaves these should be omitted. The more vigorous shoots will generally be those that will first attain the above extent of growth, and accordingly the first that are stopped or pinched. Many of the shoots will start again after the first stopping, and when these are 3 or 4 inches long they are pinched back to three buds, or to about $1\frac{1}{2}$ inch from their bases.

With regard to the terminal shoots of the branches, those that extend in summer beyond such as are situated below them should be pinched; but the others ought to be allowed to grow till the beginning of September, when they may be cut to their assigned limits, so that any further shortening at the winter pruning will be unnecessary.

From what has been already stated, anyone may rear and maintain handsome and productive pyramid Pear-trees; nevertheless, the nature of the proceedings having been explained, the chief points may now be briefly recapitulated. The tree having been trained with an upright shoot, is cut back before winter, in order that it may produce side branches near the ground; and a shoot is again trained upright and cut, so as to produce more laterals and a shoot for the continuation of the stem; this shoot may be stopped, if vigorous enough, when it has grown about 1 foot. This will tend to throw more sap into the side branches below, whilst the upright leader, from its advantageous position, will soon regain sufficient strength. Laterals from it must be pinched when they have grown 6 or 8 inches; by shortening them at the winter pruning to within 2 inches of the stem they will produce shoots strong enough for side branches, and, at the same time, the pyramidal form of the tree will be preserved. By stopping the leader in summer, side branches will result, so that at the winter pruning it will only be necessary to cut it 2 feet, instead of 1 foot, above where it was cut a year before. Thus, without danger of a deficiency of side branches, an advance of 2 feet in height is gained in one season.

In subsequent years the upright shoot may be treated in a similar manner till the desired height is attained. It is necessary, however, to

observe that where the climate is such as not to ripen the wood of the summer shoot properly, it is better to allow the leader to go on without stopping, and originate the side branches by cutting back to 12 inches in autumn. The laterals from the side branches may be made to form fruit-spurs instead of overcrowding the tree; they must be pinched under the sixth leaf when they have developed that number. The terminal shoots should be allowed to grow till the end of August, when they ought to be shortened to within eight buds or leaves of the stem, not taking into account the buds at the base of the shoot which usually do not push. At the winter pruning, the ends of the branches must be pruned so as not to spoil the symmetrical outline of the tree.

The above directions are applicable to pyramids strictly kept, and of the smallest dimensions; and anyone that can rear such can easily manage those of larger size. In some cases Pear-trees are allowed to form pyramids as much as 15 feet high, the side branches extending in proportion; but for these it is only necessary to allow greater extension to the terminal shoots of the branches, and to the upright stem; in all other respects the directions already given should be followed.

Espalier Training.—Of all modes of training the Pear-tree in the open ground the espalier, if well managed, is the most economical as regards space. If the espalier is only 6 feet high, there may be six horizontal branches on each side, and each branch extending, say, 10 feet, the aggregate length of the branches will then be 120 feet. The same extent of branches, trained as an open dwarf, would occupy a space of 10 feet square, or an area of 100 feet.

The mode of rearing a central stem, and that of obtaining branches from it where required, have already been explained; and when the horizontals are started no one can be in any doubt in training them—as far as the correct form of the tree is concerned—all he has to attend to is simply to train them right along; whilst in the fan and other modes of training, many considerations are sometimes necessary with respect to the position and direction of the branches. The espalier mode gives good command over the growth of the tree and the equal distribution of the sap; at the same time the branches are all equally exposed to light.

Equality of vegetation is conducive not only to the health of the tree, but also to its productiveness; and, accordingly, well-managed espalier trees are very productive, and generally

bear larger and better-formed fruit than can be obtained from standards. In the latter form, it is true, many of the large kinds of Pears succeed; yet from their weight they are apt to be blown down and spoiled when almost fit for gathering, whilst on espaliers all fruits are nearly secure from this danger. The quality of fruit grown in this way is often superior to that produced on east-and-west walls.

The advantages of this mode of training are many, whilst the only drawback is the expense of the espalier rail. This, however, will be amply compensated by the produce which can be obtained from well-managed trees. In all gardens, wherever they can be afforded, rails of a substantial character should be employed.

The distance between the Pear-trees intended to be trained should be about 20 feet; and the espaliers, if there be two or more parallel rows, should be 15 feet apart. When placed along the sides of walks, the line of rail ought to be $2\frac{1}{2}$ feet from the edge of the walk, and the trees should be planted 3 inches from the rail, otherwise the latter would be pressed out by the stem when it becomes thick. The trees should be planted on the side of the espalier rail next to the walk. There may be some objection to this as regards the trees on the south side of a walk running east and west; it would, it is true, be advisable to plant them on the south side of the rail, but a much better effect is produced when they face the walk on both sides.

The branches of a horizontally-trained espalier Pear-tree should be about 1 foot apart. The mode of cutting down the upright stem to obtain these is the same as in the case of the Apple. The lower one should be started a little below the line along which they are intended to be trained; the upper courses ought to proceed very nearly at right angles from the stem, and the highest one quite so.

In order that the young tree may speedily acquire strength, the shoots should not be much pinched or otherwise shortened in the early part of the summer at least. Those near the extremities of the horizontals ought, however, to be checked, so as not to compete with the terminal shoots or leaders of these branches. In order to throw more strength into the branches, the upright leader should be pinched when it presents the appearance of becoming too strong. By these means the sap will be diverted into the bases of the branches, natural fruit-spurs will soon begin to form upon them, and in four years from the time of planting, the tree will most probably commence bearing.

In order to have well-formed fruit, the fruit-spurs should not be nearer each other than 6 inches; therefore, at the winter pruning, shoots that have started growing along the branches nearer to each other than that distance should be cut off quite close. All others should be shortened back to within 1 inch of their base. Fig. 917 represents a portion of the horizontal branch of a Pear-tree. In the course of the season it will either produce shoots, as at *b*,

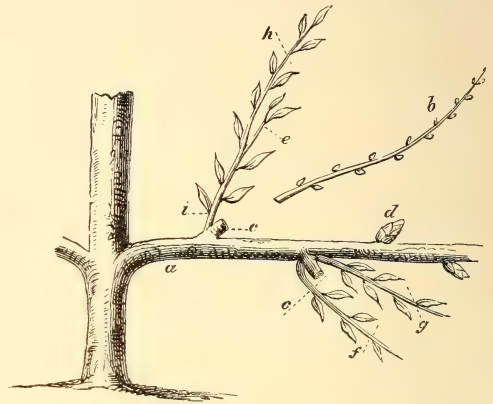


Fig. 917.—Pruned horizontally-trained Pear-trees.

or natural fruit-spurs, as *d*. At the autumn or winter pruning the shoot *b*, and others similar to it, should be cut back to about 1 inch from their base, as at *cc*. In the following spring a shoot *e* will start below *c*, from the part left of the shoot *b*, or two may appear, as *f g*. If more than two grow, all but that number should be rubbed off, or cut very close, so as not to be apt to start again. When the single shoot *e* has made six leaves, it should be pinched or cut closely under the sixth leaf, as represented at *e*. With regard to the shoots *f* and *g*, one of them should be cut like the shoot *e*, under the sixth leaf, as at *g*, when so many have been formed, the other under the fifth leaf, as at *f*. This is done with the view of giving more strength to one of the two, in order that it may take the lead, and one shoot of a fruit-spur is much more easily managed than when numerous small twiggy shoots, too weak for forming fruit-buds, are formed. In all probability the shoots which were shortened, as at *efg*, will produce shoots from the buds in the axil of the leaf below the respective sections, as at *e*. When this second shoot has grown several inches, it may be pinched or cut off below the fourth leaf, as at *h*, and likewise those that proceed from below *fh*, and others similar. At the autumn pruning, the shoot *h* should be cut back to within 1 inch of its

origin. Buds for spurs may have commenced to grow during the summer from the base of the preceding summer's shoot below *c*; if not, one or two will probably appear in the following summer. At the same time a bud or buds of this description may also form on the base of the younger shoot, at a point below *i*; but more likely a shoot will start if the tree is young and vigorous; and if so it must be managed like its predecessor.

Fig. 918 represents a shoot which has been stopped at *a*, the terminal eye has produced a shoot, *b*, which was pinched; this pinching has caused the development of the spurs *e* and *f*, and also the small branch *d*, which bears a fruit-bud, and the bud *c*, which should be stopped in August, in order to concentrate the sap on the buds at the lower part of the shoot. Should the upper portion of the shoot prove weak, then it would be advisable to cut it back to *g*.

If any branch is weaker than the rest the summer shoots upon it, or at least a considerable portion of them, should be allowed to grow without stopping till September, when a few inches may be cut off from the extremity of each. If the whole tree is weak the shoots on all the branches should be treated in a similar manner. In that case the summer shoots ought to be cut back in winter to about 1 inch from their base. From the stubs left, shoots will generally proceed in the following season; part of them may be pinched, as in fig. 917, at regular distances along the stem, others may be allowed to grow till September, when they may be stopped and cut back to about 1 inch from their base as before. There will then be about 1 inch long of the base of the first year's shoot, now two years old, and as much of the second year's shoot, which is only one year old; from this a shoot may be allowed to grow till September, when it

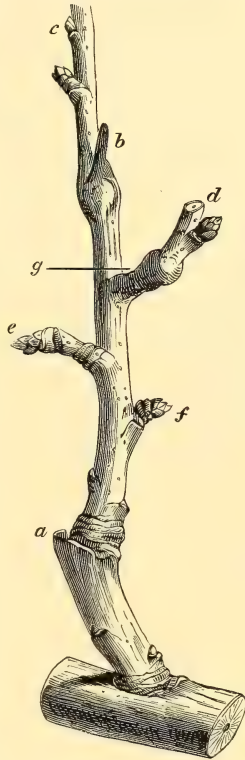


Fig. 918.—Pinching and Spur-pruning a vigorous Shoot.

should be stopped; but instead of cutting it back to 1 inch, it should be cut off entirely, together with the former year's wood on which it took its rise. By so doing, there will be left a stub consisting of about 1 inch of wood, now three years old, terminating in a portion only two years old. On such portions fruit-spurs will generally form.

Espaliers will bear well if not so closely pruned as above indicated, provided means are taken to ensure an equal distribution of the sap in all the branches. If this is neglected, no system of management will ensure fruit in that perfection which would be the case if the above principle were duly carried out. The means of doing so have been already fully explained in treating on pruning. Whether the trees are worked upon the Pear stock or upon the Quince they will generally soon become fruitful, and continue healthy and productive for a long period, if over-luxuriance in one portion be prevented by timely checking, whilst more than an average liberty is allowed the weaker portions till the balance is re-established.

Cordon Training.—Trained as a single lateral or bilateral cordon (fig. 919), the Pear does not usually succeed so well as the Apple, but this mode of culture is interesting, and a few trees may be tried. They will not form fruiting spurs so freely as the Apple, so that free-bearing sorts, of which Louise Bonne of Jersey is the type, should be selected; worked on the Quince stock this variety of Pear is adapted for all forms of training, and produces finer fruit than it does on the Pear stock. For all varieties of Pears that succeed on the Quince it is the best stock to employ for trees intended to be trained as cordons. Trees of this description are also useful for filling vacant spaces at the base of walls, but they will do no good amongst old trees unless the ground is prepared for them. The old exhausted material should be entirely removed and the roots placed in turfy loam; indeed this is the best medium for the roots of all fresh-planted fruit-trees when the natural soil is unsuitable.

Training and summer treatment may be summed up in a few words. Always bear in mind that the less pruning necessary in winter the sooner will the trees come into bearing, and the more fruitful will they be. The experienced cultivator studies the habit of his trees, and his future proceedings are regulated by the variety he has in hand. Whatever form of cordon is intended—be it horizontal,

upright, or oblique—the cultivator's aim is to obtain a regular and uniform disposition of fruiting spurs from the base to the apex of the cordon. The Jargonelle, for instance, though a very free-bearing variety even in a young state, requires persistent pinching in of the side-shoots, as well as frequent stopping of the leading shoot, in order that a regular formation of fruiting spurs may be secured; Louise Bonne of Jersey, on the other hand, will form spurs regularly if the leading shoot is pinched only once in the season. In all cases let the side-shoots be closely pinched in.

One advantage derived from training Pear-trees as horizontal cordons is that the trees, when in blossom, can be readily protected from early spring frosts, which are so destructive to our crops of choice Pears. Various methods suggest themselves to accomplish this object, such as hoops bent over the trees and covered with mats, Hessian canvas, or some similar protecting material; glass ridges have also been used.

The remaining forms of cordon are more adapted for covering wall surfaces, but in all cases the summer treatment already described is necessary. One of the best is the double oblique (fig. 919). The trees are worked on the Quince stock, and in the illustration both

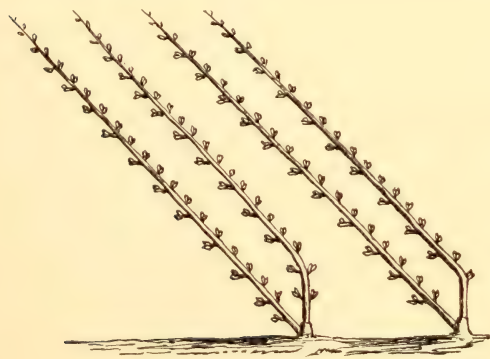


Fig. 919.—Double Oblique Cordons.

shoots are trained from the place of union, that is, close to the surface of the ground. The shoots ought also to be of equal strength, as if one is weak and the other strong satisfactory results will not be obtained. If the trees be trained at an angle of 45° , and the leading shoot of each be stopped once, twice, or thrice, according to the habit and the tendency to produce fruit-buds, they will come into bearing in the second year after planting, and in a few seasons cover the walls with healthy bearing wood. In rich and somewhat light soils, not-

withstanding persistent summer pinching, sometimes a few of the more vigorous trees will not bear; in this case lifting the tree in the autumn and replanting it in fresh loam will generally induce fruitfulness.

The double vertical cordon, trained in the form of the letter **U**, requires much care in training. The leading shoots grow rapidly and draw the sap past the side-shoots; attention must therefore be paid to this tendency and the leading shoot stopped, in order that the trees may be well and uniformly furnished. Either the above or a single upright cordon may be planted as a division-line between the usual fan or horizontal-trained wall-trees, and if a careful selection of varieties be made a good supply of valuable fruit may be obtained.

Dwarf Bushes.—For some sorts of Pears, especially those with large fruits, such as Beurré Diel, Beurré d'Amanlis, Triomphe de Jodoigne, and Beurré Rance, the bush form is better adapted than the pyramid. The fruit is not so liable to be scattered about by the autumnal winds when it is fit for gathering. The training and general management of the trees is similar to that recommended for the Apple. The branches must be sufficiently far apart not to rub against each other and injure the fruit, and the centre of the tree must be kept open, so that air and light may have free access to it. This is absolutely necessary to secure the proper ripening of the fruit.

Pruning and Training Trees against Walls.—The modes of training usually adopted are the *Horizontal* (fig. 920) and the *Fan* (fig. 921). The former is to be preferred for walls of ordinary height; but in the case of trees planted against the ends of houses and other walls which are much higher than those of gardens usually are, fan-training is the more advantageous, for by it the upper part of the wall can be much sooner covered. Ample instructions for obtaining the requisite number of branches at the proper distances from each other have been already given in the chapters on pruning and training, as regards both horizontal and fan-trained trees.

The branches of a Pear-tree intended to be trained horizontally against a wall should be the distance of four courses of bricks apart. At this distance the tree will sooner reach the top of the wall than if the branches were trained at three courses or 9 inches apart; but it may be said that, although the wall is sooner covered, it will not be covered thickly and efficiently. There will be a greater extent of uncovered

wall between the branches, but this is a great advantage, especially in the colder parts of the country; for, where a wall is almost completely shaded with foliage, it receives but little heat

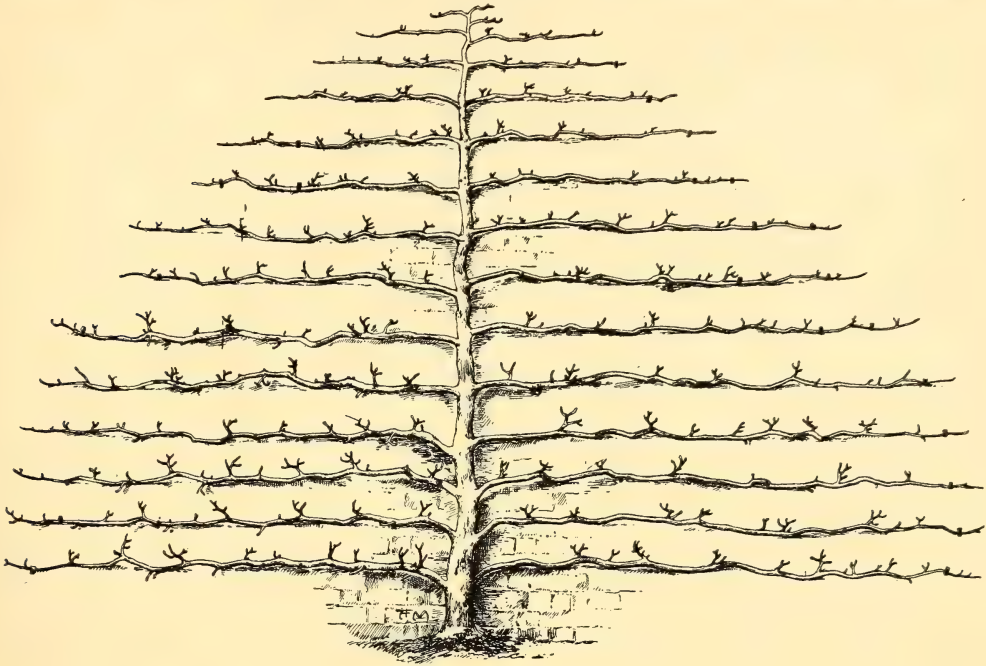


Fig. 920.—Horizontally-trained Pear.

from the sun's rays, and consequently but little can be radiated for the benefit of the tree. For this important reason a distance of 12 inches between the branches is recommended, and more

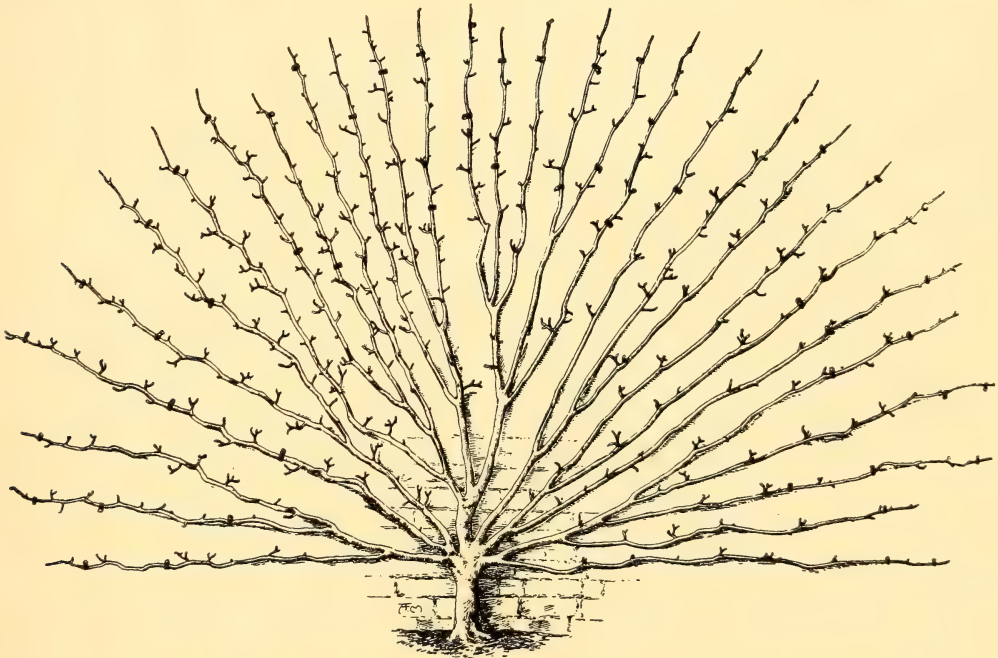


Fig. 921.—Fan-shaped trained Pear.

especially as it is well known that branches, bear as much fruit as a tree can bring to perfection, if well managed, will

The first pair of horizontals should be at least 1 foot from the ground; but we consider 15 inches preferable, because the fruit will be better flavoured than when nearer the ground. The lower horizontals should be trained at an angle of about 45° , in order to strengthen them, for they cannot be too strong, and in fact every means should be taken to encourage them to make vigorous growth. With this view, lateral shoots, if any are produced, ought to be allowed to grow freely during the summer, and their points should be taken off in September. Before winter, the upright leaders ought to be cut so as to originate a second pair of horizontals, and at the same time the laterals on the first pair should be cut to within about an inch of their base. In the second season the shoots on the horizontals should still be allowed to grow without check, except in the case of any likely to be too strong for the leaders of the horizontals, and wherever this is seen to be the case they must be pinched. The others may also be pinched if they grow long and shade the buds on the horizontal branches.

When several courses of horizontals have been obtained, the highest should be subjected to a closer system of summer pruning. They ought, for the most part, to be pinched as directed for espaliers; after an interval of five or six days the next lower tier should be pinched, and so on to the lowest. When more horizontals are formed, six courses for example, the two upper may be pinched first; after several days the next lower two, and after another similar interval the lowest two. In short, by commencing summer pruning at the upper part of the tree, and working gradually downwards at intervals, so as not to deprive the tree of too many shoots or too much foliage at one time, the trees will form abundance of fruit-spurs, and bear regularly from the stem to the extremities of the branches. The spurs will most likely be too numerous, and will require to be thinned and shortened at the winter pruning.

Pruning the Spurs.—A spur is a branch the buds of which are either blossom-buds, which do not push into regular shoots, or imperfectly-formed blossom-buds, in which case they elongate, although but slowly as compared with the growths made by the proper shoots.

Spurs are either simple, as represented at 1, fig. 922, or compound, as at 2. They require to be pruned, otherwise they would extend too far from the wall, and would lose the benefit of its warmth. It is therefore desirable to have a sufficient number of fruit-spurs as near the

branch as possible, and when that is obtained the spurs should be more or less cut back at the winter pruning. The simple spur 1 requires no

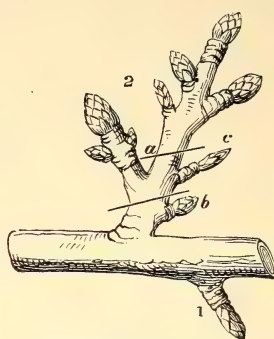


Fig. 922.—Spur-pruning.

pruning. Such a one is likely to bear fruit, and in that case its terminal growth will be arrested, and one or two fruit-buds will most probably form near its base. The spur 2 is an older production. It may be cut off at *a*, or if there are plenty of others near, it may be cut

back a little above the bud *b*, which will form a fresh spur. All buds similar to *b* are blossom-buds; but spur-buds, like *c*, may retain their slender form for years without assuming that plumpness which indicates a fruiting state. It is frequently the case that nearly all the spur-buds on a tree are of this description, and are very numerous, abundance of foliage being produced, and every year more and more of these slender unfruitful spurs. The best way of dealing with them is to cut back those on the upper part of the tree to the lowest bud or the lowest two buds, to thin and shorten considerably those situated about the middle of the tree, and to do this more sparingly in the case of those on the lower part. By these means the lower branches, which are usually weak as compared with the upper, will become equal in vigour to the latter, and elongated barren spurs will become plump and fruitful.



Fig. 923.—Spur-pruning.

The spurs on the middle and lower parts of the tree will require to be gradually reduced, and whilst this reduction is being effected, care must be taken that the upper part of the tree does not acquire excessive vigour.

Fig. 923 represents the branch *a*, on which the shoots *bcd* have been produced, and also a fruit-bud *e*, and two terminal buds *ff*; these two buds must be kept in check by stopping or pinching, in order that the sap may be concentrated on those at the base.

Fertility and Sterility.—The object of the cultivator of Pears and other hardy fruits is first to secure good trees, and secondly to obtain regular crops of the best fruit. As regards the subject of these remarks, the first object is sometimes much more easily attained than the second, because apart from climatal and seasonal adverse influences, other causes occasionally interfere with the production of fruit. The two principal causes of infertility in Pears are defects in the essential organs of the flowers and excessive luxuriance of growth, and each of these is of so much importance that they merit a somewhat full discussion, together with the remedial measures that can be adopted.

Imperfect fertilization owing to the defects in the flowers of Pears has not been so frequently observed here as in hotter or drier climates, such as in the United States, but it does occur here and is very perplexing to growers whose trees appear in excellent health, and produce flowers freely year after year, yet rarely set a crop of fruit. If the failure is due to weakness or to the opposite extreme—undue vigour—it is possible to find a remedy; but in the other case—the simple failure of flowers—it seems more difficult to understand and to deal with. The fact is that some Pears, like Apples and other fruits, become at times partially sterile mainly through the failure of the pollen, and as this is by no means constant, *i.e.* it may vary from season to season and in different localities, it has led to several careful investigations with a view to finding effectual remedies. It seldom occurs in a plantation containing several varieties of Pears, and is principally found where large quarters are devoted to one variety. The obvious remedy in such cases being the same as suggested for Apples, namely, planting those that do not set their fruit well in alternate lines with other good cropping sorts. The whole subject has been carefully and thoroughly studied by Mr. M. B. Waite, assistant pathologist to the United States Department of Agriculture, and the results of his observations and experiments were issued in 1898 in the form of an elaborate report on *The Pollination of Pomaceous Fruits*, of which the general conclusions are summarized as follows:—

1. Many of the common varieties of Pears require cross-pollination, being partially or wholly incapable of setting fruit when limited to their own pollen.

2. Some varieties are capable of self-fertilization.

3. Cross-pollination consists in applying pollen from a distinct horticultural variety, that is, one which has grown from a distinct seed, and not in using pollen from another tree or the same grafted variety, which is no better than that from the same tree.

4. Self-pollination takes place no matter whether foreign pollen is present or not. The failure to fruit with self-pollination is due to



Fig. 924.—Flowers of Pear (Beurré d'Amanhis).

sterility of the pollen and not to mechanical causes, the impotency being due to lack of affinity between the pollen and the ovules of the same variety.

5. Varieties that are absolutely self-sterile may be perfectly cross-fertile.

6. The condition of nutrition and the general environment affect the ability of the tree to set fruit either with its own pollen or with that from another variety.

7. Pollen is transported from tree to tree by bees and other insects and not by the wind.

8. Bad weather during flowering-time has a decidedly injurious influence on fruitage by keeping away insect visitors and affecting the fecundation of the flowers, and, conversely, fine weather favours cross-pollination and the setting of the fruit.

9. Pears resulting from self-fertilization are very uniform in shape. They differ from crosses not only in size and shape, but also, in some cases, in time of ripening, and in flavour.

10. Among the crosses the differences were slight or variable, so that the variations cannot be ascribed with certainty to differences in pollen.

11. Self-fecundated Pears are deficient in seeds, and the seeds produced are usually abortive. The crosses are well supplied with sound seeds.

12. Even with those varieties which are capable of self-fecundation the pollen of another variety is prepotent, and unless the entrance of foreign pollen is prevented the greater number of fruits will be affected by it.

13. The normal typical fruits, and in most

practical importance, and it deserves more attention than has hitherto been accorded to it.

When failure to fruit is due to early or too frequent overcropping, to a natural weakness, or to some deficiency of essential substances in the soil, liberal but judicious application of suitable manures will usually effect the desired alteration. It is in such cases that potash in some convenient form, together with superphosphate of lime, is of the utmost value as a restorative of fertility.

If undue vigour of growth, deep rooting, or rooting in unfavourable soils are the causes of the trouble, two practical remedies suggest themselves, namely, (1) lifting and replanting the trees, or (2) root-pruning. It is seldom that these operations are needed with Pears on Quince stocks; but for those on the free stock

in some soils, root-pruning is an essential process that must be repeated periodically. Young trees, for the first few years can be readily lifted, and if carefully replanted, this more effectually checks the excessive vigour of branch and root than any other means, but it soon becomes a laborious and expensive task, and recourse must then be had to root-pruning. By carefully removing the surface soil a few feet from the stem it will easily be found how far the principal roots extend, and a trench should then be formed round the tree, cutting off cleanly all the strong fibreless and downward roots, also carrying this out as far under the main ball of roots as may be possible. Preserve all fibrous roots, and when filling the trench again spread these out evenly near the surface. Render the soil firm, as if it is left loose it is apt to encourage increased root growth of



Fig. 925.—Examples of pruned Pear-roots.

cases the largest and finest specimens from both the so-called self-sterile and self-fertile varieties are crosses.

Accompanying the report referred to are illustrations of Williams' Bon Chrétien (Bartlett) Pears, one fruit being the result of fertilization with its own pollen, and the other from fertilization (or pollination, which is the preferable term) with pollen from Easter Beurré, the difference in shape being conspicuous, and the latter is altogether a much better developed fruit than the former. Besides possessing a special scientific interest this subject is also of considerable

the wrong character. A similar process is sometimes requisite with trees trained to walls or trellises, and if performed with judgment it speedily effects a change in the desired direction.

Routine Culture.—To ensure success with Pears, they require a good deal of attention at different times of the year, and especially in the early stages of their existence. The first season of growth after planting young trees on the Quince it is advisable to remove all flowers as soon as they show, not allowing them to expand. This must be done with care, however,

to avoid injury to the young leaves and shoots. Next in importance is it to see that, if the spring and early summer prove hot and dry, the young trees do not suffer from an insufficient supply of moisture at the roots. A light mulching round the stems will aid in the preservation of a moist condition, and it is also advisable to occasionally syringe the trees in the afternoon or early evening. This is especially beneficial for trees against dry walls, fully exposed to the sun, as, until the roots

are in full activity, the foliage soon suffers. The summer pinching must be moderate at first also for trees on the dwarfing stocks, as it is often difficult to induce sufficient growth to keep them well furnished with new wood. Pears on the free stocks soon become established and grow freely, and they require more attention in stopping or regulating the growth, though there is no trouble in removing flowers in their early years.

When the dwarf trees are well rooted and

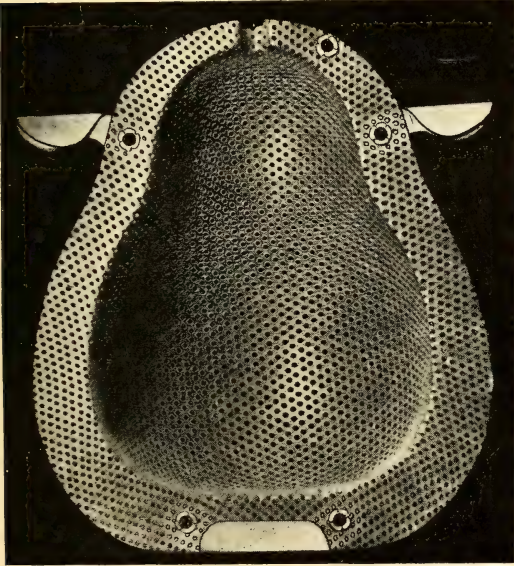


Fig. 926.—Cloister Fruit Protector (side view).

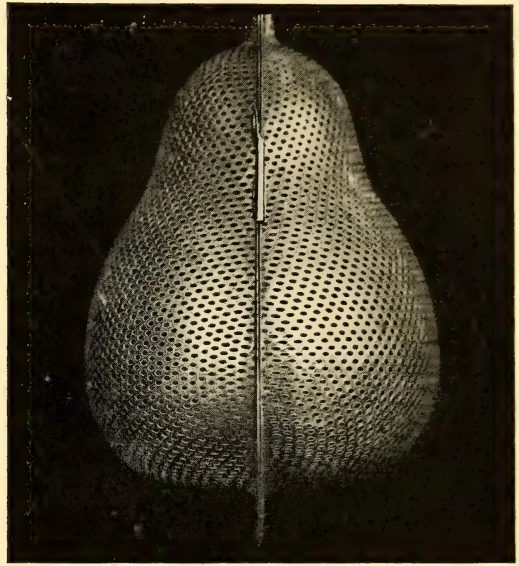


Fig. 927.—Cloister Fruit Protector (end view).

can safely be allowed to bear fruit, the question of thinning should at once be considered. A young tree on the Quince will often become very prolific, and if allowed to bear without restriction it is liable to be greatly exhausted, suffering both in growth and subsequent crops. No hard and fast rule can be laid down respecting how many fruits should be allowed to remain, this must always be a matter for the judgment of the cultivator, and should be regulated by the character of the variety and the strength of the tree. It is also wise to defer the thinning until it can be seen which fruits are taking the lead, as many will commence swelling and then fall. If the work is done immediately the petals have fallen, there is the danger of removing some that are either more fully fertilized, or, from their position or strength, are more liberally supplied with nourishment, and would develop into finer fruits if allowed to remain.

As a rule little is gained by the thinning

of flowers even when these are produced in the greatest profusion. There are so many adverse influences that are calculated to prevent an excessive number of fruits setting, that it is best to make sure of the results before removing any flowers. As regards trees on walls, which may be protected when in flower from the frost injuries, this does not apply with the same force, and thinning the flowers or even the corymbs themselves may be advisable. If it is found that the fruits do not fully develop, or if a tree is flowering and fruiting with a profusion beyond its strength, a more vigorous thinning should be tried, together with the application of additional supplies of plant food to the soil.

The Cloister Fruit Protector (figs. 926, 927) is a device for protecting ripening fruit from injuries by birds, wasps, snails, &c. It is made of perforated celluloid, which is very light and neat in appearance, and is adapted for Pears, Apples, and other fruits. It is made in two

halves with a flanged joint so that it can readily be applied without undue handling or bruising the fruit. When placed in position, suspended from the branch, the appliance is closed by clamps fixed to the edges. The material is nearly as light as muslin, and is much more durable, having been continuously exposed in all kinds of weather, fierce sun and heavy winter rains, without the least injury. It can be utilized for a variety of purposes, one of which is the protection of flowers that have been fertilized and from which it is essential to exclude insects.

To all trained trees close attention must be given during the summer months in the pinching and reduction of superfluous shoots in accordance with the directions in previous sections of this chapter. Neglect in this matter means the crowding of the tree with useless growths, increasing the work of winter pruning, and partly defeating the object of subjecting trees to artificial training.

Gathering Pears.—It was the opinion of a celebrated American pomologist, Mr. Downing, which was shared by the late Dr. Hogg and Mr. T. Rivers, that the majority of early and mid-season Pears are gathered too early. The former stated that "most varieties are much finer in flavour if picked from the tree and ripened in the house than if allowed to become fully matured on the tree". This may be of more general application in America than it is here, but it is certainly true as regards many first-class varieties in this country. Williams' Bon Chrétien is a notable example of the peculiarity, and the fruits of this variety imported from California and South Africa, which have been usually gathered at least a fortnight, or sometimes even three weeks, are found to possess an exquisite flavour when fully ripe. In this case the results are precisely the same in our climate, and it is true also as regards some others.

As a general rule, Pears are fit to gather when, on lifting up the fruit to a horizontal position, the stalk, without pulling, readily separates at its junction with the spur. When the stalk requires to be pulled and twisted, and will rather break than separate from where it joins the spur, the fruit has not acquired all the nourishment which it otherwise would derive from the tree. There are, however, exceptions to this very general rule. Some varieties that are apt to become mealy or too dry are better when gathered before they will part by merely lifting up. Again, some that

are too musky if allowed to hang till they part very easily from the tree, should be gathered before they are in that state. The Flemish Beauty must be gathered before it has even attained its full size; if it be allowed to hang till it become of a fine red next the sun, and thus acquire all its beauty, it is much deteriorated in quality, and instead of being melting, it becomes dry and musky. Some very early Pears must be gathered at a particular time: if removed from the tree a little too soon, they are watery and insipid; if a little too late, their flesh becomes mealy, or their flavour proves flat. Other early kinds ripen in succession, and must be gathered accordingly. Late varieties generally require to remain on the tree as long as they can safely be allowed to hang.

The choicest Pears on walls and espaliers should be gathered by taking hold of the stalk, without touching the fruit itself, and without displacing the bloom upon its surface, for this serves as a protection from moisture. The fruit should be placed singly on shelves; late sorts may be placed in a single layer in drawers or shallow boxes, for in such they will have a more equal temperature than on the open shelves in the room, and a steady, cool temperature is an essential condition.

Pears keep very well in clean, dry, silver sand, also when packed in kiln-dried straw, or in dried fern. Besides being employed for keeping fruit late, the two last-mentioned materials are well adapted for forwarding it, and even for ripening it. If the fruit of a variety which usually ripens in the end of December is in abundance, and if a scarcity should occur in the end of November, the later ripening sort can be brought in condition to supply the deficiency by packing it closely in dry fern in a basket, and placing it in a warm situation, say near a fire, and the fruit will soon be fit for use. Many varieties that will bear well in rather cold parts of the country, in which, however, the fruit will not naturally become melting, may be greatly improved by packing them as above and keeping them warm. The proper temperature will vary according to the variety and the greater or less degree of maturity which the fruit has acquired. Some of the Pears should be kept in a very slight heat, others of the same variety in a higher temperature, and by this means the most suitable degree of heat may be ascertained. By the above mode the quality of the fruit will be greatly improved, much more, indeed, than

anyone who has not tried the process could believe possible.

The winter routine of Pear-culture should include what pruning may be needed, and the application of cleaning solutions to the stems and branches as a preventive measure against attacks of fungus disease and bark parasites. The substances to be used and the method of applying them are dealt with in other chapters of this work, and need not be detailed here. The same remark also applies to the summer spraying against attacks of insect pests.

Propagation.—The Pear-tree may be increased by cuttings, but the process is too slow to be recommended, and we only mention it as a means of securing a variety which might otherwise be lost through the failure of buds or grafts. Cuttings in such a case might be struck, so as to keep the variety alive till a favourable opportunity occurred for working from them. If it were desired to have trees on their own roots, layering might be resorted to. We are not aware, however, that there would be any advantage in this.

Budding and grafting are the modes generally adopted for the propagation of the Pear. Stocks are necessary before the propagation can take place, and these accordingly require to be first taken into consideration.

The *Pear Stock* is the most natural for the Pear; on it, consequently, the trees possess the greatest vigour, and attain the greatest age. The stocks are reared from seeds, either of the Wild Pear or of the varieties cultivated for perry, as the seeds can be obtained in the greatest abundance from these sources. The seedlings are reared in the same way as Apple stocks. In transplanting, those of a crooked habit, or which do not exhibit a free upright mode of growth, should be rejected. In the seed-bed, some will be observed of taller growth than others; and after the first transplantation a certain portion will again take the start of others. When about to be finally planted out in rows for grafting or budding, the best should be selected, so that all the plants in each row may be of equal height and strength. For standards, the stocks should be planted out at least two years, in order that the young shoots which they produce may possess the requisite degree of vigour. They may either be grafted near the ground, at half, or at the full intended height of the stem. In the case of such varieties as are of a weakly, spreading habit of growth, it is better that the stock

should be allowed to grow up to form the stem of the tree; but with regard to varieties that have a vigorous upright growth, and are not disposed to canker, it is preferable that the stem consist of the variety worked low and trained up, the method usually adopted at the present time.

Before the sap rises in spring the stocks should be cut back nearly to where the graft is to be placed. The scions ought likewise to be cut off before their vegetation is excited by mild weather; they may, nevertheless, be taken and worked at any time before the leaves expand. In this case it is advisable to pick out the buds which have started growing, as they would evaporate the sap and dry the scion before it could unite so as to derive nourishment from the stock. There are usually two small buds, one on each side of the principal one, and they generally remain dormant; but when the central bud is removed the sap flowing towards it is shared by the lateral ones, and they consequently become developed so as to contribute to the formation of a union with the stock.

Although grafting may be thus effected and advantageously practised in particular cases, yet it can only be considered as an exception to the general rule—that of cutting the scions before the buds exhibit signs of starting. The scions should be kept till the grafting season, in the same way as already directed for those of the Apple.

Quince Stocks.—The Quince is readily propagated for stocks by cutting down the plants when they are strong enough to throw vigorous shoots, and the bases of these are covered with earth in order that they may form roots. This mode is adopted in the neighbourhood of Paris, but better plants will be produced by layering at any time during the winter months, and proceeding in the following manner:—When the young shoots are laid down, there should not be more than two eyes left above ground, and when those have grown 5 or 6 inches long, one of them should be cut clean off, leaving the other to form the plant, which by the autumn will be 3 feet high. The layers must be taken off the stools as soon as the leaves are fallen, and planted out in rows at 3 feet apart from row to row, and 10 or 12 inches from plant to plant in the row. At the end of one or two years they will be fit to bud or graft with the different sorts of Pear.

The Quince commences growing early in

spring if the weather is at all favourable. In mild springs we have seen it in leaf at the usual grafting season in March, and we have also seen the plants headed down at that period and grafted, but with very bad results. Either the grafts did not take at all, or but imperfectly, for the Quince stock, having been cut when the sap was flowing, died back to a considerable distance below the place where it was cut over, so that if the lower part of the scion did unite with the Quince the upper part of the splice could not. To the circumstance of not cutting down Quince stocks till their vegetation is too far advanced is chiefly to be attributed the want of success in grafting them with the Pear. The stocks should be cut down in January nearly to the place most eligible for grafting. It is then advisable to leave a little to be cut off at the time of grafting, because severe frost may ensue, and occasion some small splits or cracks in the exposed section of the stock.

In using the Quince as a stock we want its root, and but very little of its stem—no more of it indeed than is sufficient to receive the scion. If the scion were placed, say 9 inches or 1 foot above the surface, the Quince portion of the stem below that height would most probably not increase in thickness in the same ratio as the Pear, and thus, instead of the stem being thickest near the ground, it would be abruptly smaller. The Quince should therefore be worked close to the ground, so as to have no portion fully exposed to the drying influences of the sun and air. Whip-grafting is the best to adopt. After the scions are on the stocks it is a good plan to earth them up as high as the top of the junction.

As the roots of the Quince run close under the surface, and as it would not be advisable to disturb them by taking soil for earthing up from between the rows of stocks, it should be taken from the alleys or elsewhere. When these particulars are attended to, the failures are very few. Of all things, the necessity for cutting down the stocks early in January should be particularly borne in mind. It may even be done in December.

When intermediate stocks are worked on the Quince, the usual method is to allow the latter to make two years' growth; then bud or graft the intermediate variety upon that, again allowing two years' growth; then cut the second stock back to within a few inches of the Quince, and graft the desired variety upon this. By this means the roots are always four years older

than the scion, which makes a material difference to the subsequent progress.

Diseases.—Canker. The principal disease to which the Pear-tree is subject is canker, which attacks some varieties more than others; indeed, in both the Apple and Pear this disease manifests itself in a manner so nearly alike, that what has been said of it in regard to the one fruit is also applicable to the other. Extremes of moisture and dryness at the root are to be guarded against. Where canker makes its appearance, the soil should not be made too rich, for over-luxuriance of growth seems to encourage the disease, at least in our variable and ungenial seasons. It frequently happens that for several weeks, with a warm south-west wind, vegetation is much excited in the early part of the season, and afterwards all at once checked for almost as long a period. This sudden stagnation must affect the tree injuriously, and a tendency to canker is the consequence.

Various Pears, such as the Jargonelle, in many localities are apt to suffer from canker in the open ground, but they continue healthy against a wall, all other circumstances being the same. The growth of shoots should be encouraged as much as possible in the early part of the summer, in order that the wood may be matured before frost sets in. When the trees commence growing, and shoots are being rapidly made, care should be taken that they receive no check from want of moisture; for if it is then stopped the trees are more disposed to grow late in autumn, which is not desirable. A Pear-tree that may have at one time too little moisture is badly compensated by having too much at another time. Roots that are rendered inactive from being in dry soil cannot be supposed to act so well, when abundance of moisture reaches them, as others that have never suffered from dryness. If we wished to favour canker in a tree, we should select one that had grown vigorously during some rather moist season, and in the first dry hot year, when the roots had absorbed all the moisture within their reach, and could only yield a very inadequate supply to the leaves to make up for evaporation, we should afford it no assistance. Meanwhile the leaves, deprived of their regular supply from the roots, will drain the tree, growth will be arrested or greatly checked, perhaps till autumn, and then a late growth will ensue. It is well known that shoots made under these circumstances are soft and watery, never becoming matured, consequently they are ex-

PEARS

The Pear takes rank with the Apple as a popular hardy fruit. Its history as a cultivated tree dates back to the Roman period, Pliny describing varieties which were distinguished by special flavour or aroma. The number of varieties now known to be in cultivation in the British Islands probably exceeds 1000. Most of these are of continental origin. In France, Pears have received much attention for many centuries, the climate there being exceptionally suited to them. The popular old Windsor Pear is said to have originated in that country several centuries ago. The prototype of Garden Pears, *Pyrus communis*, a native of Europe and Western Asia, and not uncommon in our hedgerows, has small, hard, somewhat dry fruits. The process of evolution which has resulted in the large, luscious fruits of the best garden sorts has been very slow; at first by the selection of wildings or chance seedlings in cultivation, but latterly by cross-breeding or inter-crossing the best varieties. It is usual to graft the varieties on either the wild Pear or the Quince, the latter producing as a rule the most satisfactory results, whilst trees on the former stock, though slower in coming to fruitfulness, are much longer-lived. The extent to which Pears are grown in some districts in France is shown in the statement that upwards of 700 tons of the fruit have been sent away from one station (Angers) between July and January. The varieties represented in the Plate are three of the best dessert Pears grown in England.



PEARS:—1, BEURRE DE JONGHE. 2, DOYENNE DU COMICE. 3, EMILE D'NEVILLE.

tremely liable to be affected by severe frost. All these derangements from unseasonable and imperfect growth tend to favour attacks of canker; and as they recur more or less frequently, so will the tree be affected in a greater or less degree.

Although it has been recommended to encourage growth as soon as the weather is favourable, yet where there appears to be a disposition to canker, a rapid and over-vigorous vegetation should be guarded against. The use of rank manures must be particularly avoided; whilst, on the contrary, the application of fresh soil will prove advantageous. The special and direct treatment of this disease and other fungus attacks are dealt with in the chapter on PLANT DISEASES.

Insects, &c.—For descriptions of the insects and other enemies of the Pear, see the chapter on this subject, where references will be found to the following:—

Bark Enemies.—Apple Mussel Scale, Pear Oyster Scale, Pear Sucker, Wœberian Tortrix. *Bud and Flower Enemies.*—Apple Blossom Weevil. *Fruit and Seed Enemies.*—Birds, Grape Moth. *Leaf Enemies.*—Figure-of-8 Moth, Garden Chafer, Lunar-spotted Pinion Moth, Pale Brindled Beauty Moth, Pear-leaf Blister Moth, Pear-leaf Mite, Red-footed Beetle, Slug-worms, Vapourer Moth, Winter Moth. *Stem Borers.*—Goat Moth, Stem-boring Weevils, Wood Leopard Moth.

PEARS FOR MARKET.

Many of the details already furnished concerning the general commercial aspects of Apple culture for market are equally applicable to Pears grown with the same object. But if experience and caution are needful in the former case, they are still more important where Pears alone are to be relied upon for the returns. This, however, is rarely the way in which Pears are cultivated for profit; almost invariably they constitute a portion of a mixed plantation, though the proportion as compared with other fruits will vary in accordance with many circumstances.

Difficulties and Defects.—Except in the most favourable situations, there is considerable risk in planting Pears largely in open plantations when profitable results are essential to success. Occasional crops even of good fruits afford growers a poor chance of a satisfactory balance, and something like regularity in the annual produce is required. As far as it is possible

by judgment and experience to ensure this, it must be provided for by special attention to the peculiarities of situation and aspect that may affect the results, and which have already been fully described in the chapters on Apples and Pears. The early flowering of the Pear renders it especially liable to frost injuries at that important period, therefore it is useless to attempt its culture commercially in any position that is exposed to this danger in a conspicuous degree. Further, the Pear requires abundant direct sunlight to develop its fruits to perfection of size and colour, and to ensure the maturity of the growth for continuous cropping. To secure good size there must be adequate supplies of moisture without stagnation, as, though the Pear will thrive in a moderately dry atmosphere, it will not endure an arid soil about its roots. If the trees suffer from any defect in this respect the market value of the fruit produced will be insignificant, for within certain limits size in Pears, as with other fruits, rules the selling prices to a material extent.

The best Pears will pay for careful cultivation and the greater expense needed to ensure the attainment of success, better even than Apples, as regards the actual money returns per tree and area occupied, provided the conditions enumerated are duly adjusted. But for the finest fruits at the highest prices the market is more limited, and the distribution is therefore more difficult and uncertain. Where British growers can produce and place in the markets Pears equal in quality to those imported, at an equally low price, the opportunities for increased sale are much greater. The climatal and other difficulties here must naturally restrict to comparatively few districts the possibility of competing with favoured rivals on profitable terms, though very much more could be done to improve the prospects of home growers by closer attention to our competitors' methods. As it is, the substantially profitable portion of the home Pear trade is confined to two classes—(1) the sale of small early fruits from large established trees on the free stock, and (2) the marketing of the choicest examples, such as are obtained from the best-grown pyramids, with espaliers, cordons, or similar trees trained to walls.

With the first class very little expense or trouble is incurred. The fruit is often sold direct to the retailer, who in many cases undertakes the gathering; or it is forwarded in bulk to the more populous cities, and there immediately distributed by costermongers, &c. The prices realized are necessarily low, and will only allow

of a good margin when the fruit can be sent by the ton and at the lowest rates obtainable, but where the trees are fully developed and in prolific condition the results yield a substantial profit. It must, however, be remembered that such trees cannot be raised in a few years; it requires half an average human life to bring them to their prime, and they indicate the truth of the saying: "He who plants Pears, plants for his heirs". Still, it is well to be the heir or successor to men who have had the foresight to plant such fruit-trees, and there are many who are conducting profitable market businesses at the present time, who have ample reason to rejoice that their predecessors were not influenced by the same ideas as the individual who objected to provide for posterity because posterity had done nothing for him.

The second class mentioned includes not only the best Pears grown specially for market or to supply the fruiterers in the large cities, but it also comprises a quantity of private-garden produce—either the surplus from the family's requirements, or where, from reductions in income, or changes owing to deaths, the garden is let and the whole of the produce is sold. In the latter case, when there may be a large extent of wall space covered with well-grown Pear-trees and the rent is moderate, the cultivator will have a good chance to succeed. Obviously, it would never answer to rent such gardens at their residential value, or to pay interest on the outlay which had been incurred for private purposes only.

Between the two extreme classes named large quantities of British-grown Pears are sent into our home markets of decidedly inferior quality, and in a condition that only serves to heighten by contrast the carefully-selected, tastefully and securely-packed samples which reach us from the Continent and America. There is scarcely a market of any importance where, during the autumn months, home-grown Pears cannot be seen just as they have been gathered into bushel or other baskets, unsorted and displaying very little more care on the part of the seller than would be bestowed upon Potatoes or Onions. Yet often the varieties are as good as, or better than, those which are commanding far higher prices for foreign growers, and in the majority of instances include fine samples, so that if one-half of the fruits had been rejected before paying carriage upon them the prices might have been increased three- or four-fold. This has so frequently been pointed out, and the evidence is so clear to those who observe

market results closely, and who have a moderate experience in the sale of fruit, that it is surprising the matter should be so persistently ignored. The cultivator's best efforts are heavily handicapped by neglect in the details referred to—in fact, what British growers have to learn in many cases, is not how to produce the finest fruit, but how to place it on the markets to the best advantage. Improvement of a most important character could be effected in this direction as regards the bulk of the Pear crop in the United Kingdom, and it is mainly by attention to this, and by reducing the cost of production to the lowest point of efficiency, that the keen competition from outside our islands can be met with a prospect of success. Commercial fruit-growing cannot be treated as a hobby or an amusement merely; if it is expected to yield the profits of a business, it must be conducted on the most exact business lines, and this is especially applicable to the culture of Pears for market at the present time.

Foreign Trade in Pears.—A brief review of the methods adopted by our chief foreign rivals, and the condition of the industry in their hands, should furnish some ideas of service to home growers. France has for many years been a formidable competitor in the production of Pears, and such quantities of well-grown, selected, and carefully-packed fruits have been placed on our leading markets, that prices and sales have been proportionately reduced for home growers. The closest attention has been paid to the production of Pears on the most economical systems, and the successful examples have been followed, modified or improved, by cultivators in other countries more readily than by our own, who have yet been chiefly concerned in the results of the competition. In recent years the French growers have had to contend with the Californian producers, and have suffered somewhat in the contest, but substantial returns are still obtained in all the best districts. The extent to which Pears are grown in some districts of France may be judged from the statement that upwards of 700 tons of this fruit have been sent away in a season from one station (Angers) between July and January. In the same district Pears are also propagated in great numbers to supply continental growers chiefly, indeed it is placed on record by an excellent authority, that of five varieties alone 135,000 trees are annually budded and grafted. At the head of these is Easter Beurré, of which 40,000 are produced, Duchesse d'Angoulême, Williams' Bon Chrétien, and Louise Bonne fol-

low with 25,000 each, and Doyenné d'Alençon with 20,000. The last-named is not in general cultivation in Great Britain, though it has occasionally been mistaken for Easter Beurré. It is principally valued in France for its productiveness, but its quality and late keeping properties are also notable, as well as its good constitution, characteristics which are prominent in the variety where it thrives in the United Kingdom. There is much land in the Angers district, which comprises a considerable area in the country drained by the River Loire, where Pears succeed to a remarkable degree, the cause, no doubt, being partly climatal suitability, and numerous examples of profitable planting could be given. One will serve as an illustration, and it is the more remarkable, as the 5 acres are planted with two varieties only, namely, Williams' Bon Chrétien and Beurré Giffard, and these, it is said, in a good season, yield a return of £75 to £80 per acre, a result, however, which is far surpassed in some other districts. Nearer Paris are several thriving plantations, one of which is described as producing an annual return of £150 to £200 per acre, Louise Bonne and Duchesse d'Angoulême being the varieties chiefly grown, and all in the form of dwarf trees. From the Montmorency district Pears have been exported at the rate of 100 to 130 tons per annum, valued at £20 to £40 per ton, or a total of £2000 to £5200. As a further example of the French Pear trade, Mr. W. Robinson has stated, as within his own knowledge, that one dealer every year collects and sells no less than £10,000 worth of French Pears. Many other facts bearing upon the question of returns and profits on Pear culture for market in France are enumerated by M. Charles Baltet, in an excellent paper which appeared in the *Journal of the Royal Horticultural Society*, vol. xix., part 2, 1895.

With regard to the methods adopted by French cultivators, the principal systems are similar in general practice to those prevailing in Great Britain, Pears usually taking the place of Apples. Thus market-gardening is combined with fruit-growing on both a large and small scale, the small holdings predominating, especially near Paris or other large towns, where they range from 1 to 3 acres, with a few extending to 5 acres (= 2 hectares). In some cases, however, the plantations are wholly devoted to fruit, but as a rule these are rather more distant from the towns, the land being cheaper either to rent or purchase. Highly rented as land is in our own country in the proximity of towns,

we by no means have a monopoly in this respect, for the best market-garden land at a convenient distance from Paris commands a rental of £10 to £20 per acre. The French grower has the advantage in three respects—1st, he does not so frequently lose his Pear crop by spring frosts as we do; 2nd, he has a lower expenditure for labour, partly because in the smaller market holdings he performs the greater part of the work himself with the aid of his family, and partly the actual cost of hired labour is less, taking into consideration the longer days that are made by workmen; 3rd, the best systems of selecting and packing fruits for home sale or export are more generally understood and more uniform than here; there is also more co-operation in the shape of syndicates, enabling fruit to be forwarded to distant markets in bulk and at the lowest rates. All these points tell in favour of the producer, and especially apply to the trade in Pears.

Standard, dwarf, and trained Pear-trees are grown to furnish the supplies, but the two latter preponderate. Dwarf trees are sometimes grown, as they are here, between vegetable and salad plots; while the trained trees, of which large numbers are grown, are commonly secured to walls, which much more frequently surround small holdings than they do here. The system of wiring walls, generally adopted, also renders this method a convenient one, as the trees are readily secured, trained, or untied when necessary.

Boxes are almost invariably used for the exportation of French Pears, the fruits being very evenly graded, and packed in one, two, or three layers, usually with paper only, either in the form of sheets or as paper shavings. In the majority of cases the boxes are stamped or labelled with the name of the variety, the grower's name, or that of the syndicate or shipper, so that the brand is recognizable as a guarantee of the quality. The number of the fruits per box may also be placed on the box. In a few districts baskets are employed that contain rather more than half a bushel (about 33 lbs.) of fruits, but these are rarely used for the best Pears.

Californian Pears.—Within recent years an enormous export trade with Pears has been developed in California, and the high quality of the fruits, together with their handsome appearance, has rendered the growers in that portion of America even more formidable rivals in the British markets than those in other states who ship such large quantities of Apples. Califor-

nian soils and climate evidently suit some varieties of Pear admirably, and they are not short-lived either, for trees are in existence there and still producing fruits which are known to have been planted for 125 years. The fruits also attain considerable size, and the samples that reach us are remarkable for their fresh clear skins and bright colour as well as rich flavour. The chief favourite is the Bartlett, our Williams' Bon Chrétien, which, owing to the varied climatal characters of the different districts in California, can be placed on the markets over a period of four or five months, namely, from July to November, both extremes being exceptional, and the bulk of the produce would not extend beyond two or three months. Many other Pears esteemed in Britain and France are favourites in California, such as Beurré Diel, Doyenné du Comice, Glou Morceau, Winter Nelis, Easter Beurré, Louise Bonne of Jersey, Vicar of Winkfield, Beurré Clairgeau, Beurré Bosc, Duchesse d'Angoulême Seckle, Beurré Hardy, Souvenir du Congrès, and Clapp's Favourite. There are also some that are at present mainly confined to Californian growers, namely, Dana's Hovey or Winter Seckle, Lawson or Comet, Dearborn's Seedling, Bloodgood, Harvest or Sugar Pear, Early Wilder, P. Barry, and Block's Acme. Some of these are grown for local sale chiefly, but others like the last-named—Acme—reach the London markets in excellent condition.

All the Californian Pears intended for European markets have to be gathered well in advance of their ripening period, and the greatest care is bestowed upon this matter, the selection, grading, and packing. All the best Pears are shipped in wooden boxes or cases holding a few dozen fruits each; every fruit is separately wrapped in paper, which usually bears the name of the grower in prominent letters, and the name of the variety is stamped on the boxes. The result of this superlative care and attention to details is that the Californian Pears command a sale at prices largely in excess of the inferior samples with which our markets are frequently flooded, and sufficient to pay the growers a substantial interest on their outlay, notwithstanding the long distances the fruit has to travel. The American Pomological Society has recorded an instance where a company exported Pears very extensively, and were able to pay a dividend of 50 per cent; but how long this continued we do not know, obviously it must be quite an exceptional case.

The Colonial Pear Trade.—Apples we have

received in abundance from Tasmania for some years, but the colonial Pear trade has been very limited; now there are indications of considerable development in some directions. From South Africa Pears have been exported to Britain for several years, but lately there has been a material increase, as the trees planted some time since are coming into bearing. Boxes of Williams' Bon Chrétien, from the Hex River district in Cape Colony, were put on the London markets in 1900 and 1901 in excellent condition, and these supplies are certain to increase largely, as they reach here at a time when they do not affect either the European or American trade to any great extent. In some districts of South Africa the Pear thrives remarkably, growing very quickly into finely-developed prolific trees. We have heard of plantations only formed within the past five years where the trees already exceed 20 feet in height.

Large consignments of Pears also reach us from Belgium and the Channel Islands, but as they display no special characteristics as apart from the French trade, they do not need particular reference here.

The Home Trade in Pears.—It is evident that the British grower who has to face the competition indicated in the preceding notes requires both skill and business acumen to give him a chance in the struggle. It is useless attempting to grow Pears for the leading markets where the conditions will not permit the production of first-rate fruit. The sorts to be grown must be selected with care, and all the other details that affect the selling value must have the closest attention.

With all the difficulties arising from our climatal variability, there are situations where, by taking an average of several years, Pears can be made to pay satisfactorily, and there is room for extension. Ample evidence of this is afforded by the official Report on Flower and Fruit Farming in England, prepared by Mr. William E. Bear, under the direction of the Royal Agricultural Society in 1899. This comprehensive review indicates some of the most successful growers and plantations throughout the best districts of England, which, as regards Pears, are chiefly confined to the southern and western counties. In the metropolitan market-gardens, especially those west of London, Pears have been largely grown for many years, and profitable results have been secured wherever the situation has been well chosen, and the greatest care has been bestowed upon the culture and marketing. As the density of the

population increases, and the smoke area extends, the market-gardener is being driven farther out, and there are now thousands of acres of market-garden and Pear-growing land already in the hands of the builders or in preparation for them.

The principal sources of the home supplies of Pears to the London markets are still Middlesex, Surrey, Kent, Sussex, and Hampshire, where an abundance of fine fruit is produced, though it is not placed in the markets in the most approved style. A few of the more energetic growers are setting good examples now, though probably they do not find it to their advantage to impress neighbours and rivals with the importance of following them. Struggling men in business cannot afford to devote time to the thankless task of pointing out the mistakes committed by other growers, who have the same chances of learning as themselves.

Within recent years there has been a material improvement, which it is to be hoped will advance even more rapidly, and this is largely due to the excellent systems of horticultural education organized in the home counties. In the south-western counties, where Pears are successfully grown, good work is being accomplished in a similar direction, Wiltshire, Somersetshire, Devonshire, and Cornwall being prominent in this respect. Again, in the west, admirable work is being performed in Herefordshire and Worcestershire, particularly in the last-named county. These are only examples of the tendency to improvement which now prevails, and which is, indeed, as essential in horticulture as in all other businesses. This must include the modernizing of methods in Pear production and sale, which may be summarized in the following hints.

Summary of Essentials.—Do not commence Pear-growing on a large scale in any position unless there is reliable evidence from existing trees that Pears can be satisfactorily grown with a prospect of something like regular cropping, or unless the conditions are such as to leave no reasonable doubt that this result may be expected. Commercial growers cannot indulge in much experimental work, or, if they do, it must be mainly in the direction of testing varieties in a small way before planting largely. For instance, if a large mixed plantation of fruits is being formed, and there is some uncertainty respecting the possible success of Pears, a few trees of different varieties could be tried, and their number subsequently increased in proportion to their behaviour. This is the

safest method in any case, but it is a slow one, and in many districts where Pears are undoubtedly at home, it would involve an unnecessary delay.

Only those varieties should be grown that possess some well-marked characteristics that will command the attention of purchasers. Size, form, colour, and quality must be considered, and if all can be combined in one variety the ideal market Pear will be secured, provided the tree possess the two other characters of hardiness and free cropping. It must, however, be remembered that a handsome Pear of good size will sell to better advantage in the general markets than small samples of unattractive appearance though of the highest quality. For the latter, a retail trade direct with consumers who require quality only is more satisfactory than a market trade, except as regards a few salesmen who make a speciality of high-class fruits.

The season at which the fruit is to be sold must be considered in selecting varieties. The majority of market-growers now rely upon early and mid-season Pears, and very few attempt to store any, so that late Pears have been generally discarded in recent years. There is another side to this question, however, and Mr. S. T. Wright, superintendent of the Royal Horticultural Society's Gardens at Chiswick, refers to it in the following terms: "A variety in use from Christmas onwards, that has been in excellent demand of late years, is Joséphine de Malines. If it is allowed to hang on the trees as long as possible, in fact until there is danger of sharp frost, the fruit will frequently keep until early in March, and if sold then will bring from 20s. to 30s. per cwt. although the fruit is below the average size; but owing to the demand for Pears early in the new year, size is not so important as a fine appearance and a good flavour." It must be admitted that 2d. to 3d. per lb. is not an extravagant price, but with good-sized trees in full bearing this would yield a considerable return per acre. It is advisable to make a selection that will maintain a regular supply of fruit throughout the Pear season, and it is preferable to have sufficient trees of a variety to enable the grower to send to market a quantity of each at one time. Single baskets or boxes of Pears as samples are troublesome to the salesmen and unsatisfactory or misleading to the sender. At the same time it is not safe to rely upon one or two varieties alone, as seasonal influences will sometimes affect one sort adversely while another may escape.

Liberal cultivation must be provided for Pears that are to be grown profitably, and this includes not only manurial aid when required, but the closest attention to all the details of pruning, spraying, land-cleaning, and general routine. Where fine fruits are desired and free setting is the rule, thinning is an operation that will pay for the time expended upon it, even though it be tedious work and demanding much care. If an even crop of uniform fruits can be obtained it saves some after labour in sorting, and the trees are not unduly exhausted by partly developing a quantity of useless fruits. Should the thinning be done too early or with insufficient care, it will result in a serious loss; therefore, desirable as it is under the right conditions, it must not be attempted in a reckless or haphazard manner.

Gathering is another operation demanding both care and judgment, as carelessness may easily take a heavy percentage off the value of Pears, however fine they may be. For all the best fruits padded baskets should be used, and the Pears being gathered by the stalk, not roughly clutched in the hand and pulled, as is too often done, must be placed in the basket, which should be preferably wide and shallow. If it is necessary to put in more than one layer, separate them by sheets of soft paper, and never throw or drop the fruits on to those already gathered. If they will not pay for this extra care, they certainly will not for the rough-and-ready methods by which a few shillings may be saved in labour and as many pounds lost in the prices. The slightest bruise or injury to the delicate skin of a Pear becomes a serious disfigurement when a package is opened after a long journey, and such defects are even more conspicuous in fine samples than in those of average merit. If a heavy weight of fruits is piled up in one basket, or if they are simply turned or rolled out where they are to be sorted, instead of being taken out by hand, injury often results, and by a smart careful man the work can be done quite as expeditiously in the right way.

The importance of grading has been repeatedly referred to, but it cannot be too frequently impressed upon those engaged in the keen competition of the times. Few salesmen have had a better opportunity than Mr. G. Monro of Covent Garden Market of judging the defects or merits of British growers' methods of marketing, and this is what he says about Apples and Pears: "They are sent in bushels and half-bushels; I cannot say packed, as the

bulk are simply thrown in, without any grading or packing being taken into consideration at all, in some cases only a sheet of very thin paper being placed on the top, and nothing else whatever to prevent the fruit being bruised by the basket. A customer of mine suggested the other day that a sample looked as if they had been 'gathered with a clothes-prop and packed with a rake'. These fruits are certainly packed worse now, on the whole, than they were twenty years ago, and as the competition from abroad is keener every year, it is very important that we should consider whether we cannot improve matters somewhat" (*Royal Horticultural Society's Journal*, vol. xviii., 1895).

As with Apples, it seldom pays to market more than the first and second qualities of Pears when they are sorted into three grades. It is impossible to fix a gauge for the different grades, as this would vary not only with the varieties, but in successive seasons and in proportion to the grower's success as a cultivator. The standard must therefore be chiefly a matter of judgment, but the fruits of each grade should be as even in size as possible. Some knowledge of the capabilities of the varieties is essential, the grower should familiarize himself with the finest samples in the markets and at horticultural shows, because he then gains a correct idea of what he may accomplish and of the actual value of his own produce. It may save some expense, and certainly some disappointment, if he is aware that his best fruits are only second-rate of their variety; or, on the other hand, should he have an exceptionally handsome sample of a variety, he will be better able to form an approximate estimate of its sale value.

The care advised in gathering and grading is equally needed in the packing of Pears, or all other good work will be nullified. The fruits must be firmly packed without being crushed, and they should be protected from direct contact with the basket or box by means of paper shavings, fine wood-wool, or cotton-wool, with soft paper over this next to the Pears. The system adopted by the Californian and other growers of wrapping each fruit separately in a small square of stamped paper is undoubtedly an excellent one where the fruit has to be sent long distances or to remain in the packages for a considerable time, but how far it would pay here is a question for each grower to settle for himself. We are inclined to think that for the finest samples it would be found both satisfactory to the customer and profitable to seller, just as the largest retail fruiterers find it to their

advantage to display their best fruit with the aid of a little coloured paper.

If boxes were more generally employed for the finest British Pears, it would be much easier to develop that direct communication between the producer and consumer that must be to their mutual benefit. The use of boxes also, strong but cheap, that can be given with the fruit, avoiding all the trouble and expense of returned empties, would facilitate the extension of the market trade as well as the direct retail business. The majority of salesmen would gladly be relieved of the responsibility and expenditure involved in providing baskets, which constitute a serious item in the business. The boxes provided by some of the railway companies are cheap, and as regards the smaller sizes, are strong enough for the safe conveyance of Pears with good packing and ordinary care in transit. The three most convenient sizes for this purpose are the following:—No. 3, 15 inches long by $10\frac{3}{4}$ inches wide and 5 inches deep; No. 4, $16\frac{3}{4}$ inches long by $11\frac{1}{2}$ inches wide and $5\frac{1}{2}$ inches deep; and No. 5, $18\frac{1}{2}$ inches long by 13 inches wide and 6 inches deep. These are sold and delivered on the systems of the respective companies at 2s. 6d. (No. 3), 3s. (No. 4), and 4s. (No. 5) per dozen. These will take two layers of fruits, and will hold from $1\frac{1}{2}$ to 2 dozens. Upon the majority of railways such boxes filled with Pears can be sent at owner's risk by passenger trains to a distance of 100 miles for 6d. to 8d. Within 50 miles from the starting-point a weight of 24 lbs. can be thus forwarded for 6d. Similar boxes can be readily constructed as a means of utilizing labour in the winter or bad weather, but unless the wood is bought in very large quantities and the men are very expert, the cost will usually exceed that stated. It is convenient to furnish the box-lids with simple wire hinges and a fastening in front, so that nailing may be avoided, but cording is a safeguard that adds somewhat to the expense. The sides and lids may be branded with the senders' name and that of the variety, together with the number or weight of the fruits, but preferably the former.

The prices of Pears show an extremely wide range; even taking the averages, the variation is often surprising. Thus the commoner Pears or unsorted fruits in half-sieves or in bushels (50–56 lbs.) may range from 2s. to 6s. per bushel, while in scarce seasons the latter may rise to 10s. or 12s. Selected fruits in boxes show even greater variance, for they may run

from 1s. per dozen fruits up to 6s. per dozen, the latter being an exceptional rate, although sensational Pears of the Belle de Jersey type may be seen in shops at the fancy prices of 30s. per dozen.

Owing to the great productiveness of Pears, they yield a large return for the space they occupy when the prices are not excessively low, and in suitable localities afford a better return than Apples, but except under special circumstances they are a less reliable source of income to the general grower. Still, with the requisite attention to the details here set out, British cultivators might command a larger and more profitable share of the home trade than they do at present.

SELECT PEARS.

The following descriptive list is intended for reference as regards the principal characters of a Pear with which a cultivator is concerned, and respecting which he most frequently requires information. Only varieties which possess some recommendations have been included, but those of variable character have not been entirely excluded, because under the right conditions some of these are of excellent quality. The newer sorts of Pears are still under trial, and more experience with them is needed before they can be generally depended upon, but



Fig. 928.—Pear. *Bellissime d'Hiver*. (f.)

several now in trade lists are of very promising character.

In the descriptions the average character has been taken as far as possible; thus a "large" Pear is one which under ordinary good culture

would be not less than 4 inches in its largest diameter, a "medium-sized" Pear would be about 3 inches, and a "small" Pear about 2 inches in diameter. With special culture, particularly as cordons or espaliers, the last two sizes are often materially increased, but as re-

compact in habit on Quince, very prolific. Fruit medium, roundish, green and yellow, melting and of good flavour.

Althorp Crasanne.—October–December. A variety of high quality where it succeeds, in some places only second-rate. Tree hardy, of free growth, and prolific, suitable either for pyramid or standard. Fruit medium, roundish, green and brown, juicy and rich.

Aston Town.—October–November. Usually a first-rate Pear. Tree of strong habit and fertile on the Quince as a pyramid; it also makes a fine standard on the Free stock. Fruit small to medium, roundish, green and yellow with russet, melting, of a fine aromatic flavour.

Autumn Bergamot.—October. An old variety, still good under the best conditions, otherwise apt to be disappointing. Tree of free growth and prolific on the Quince; also forms a vigorous fertile standard. Fruit small, greenish-yellow and brown, melting, and finely flavoured.

Autumn Nelis.—October. Excellent in quality, but the fruit is of very short duration. Tree hardy and compact on the Quince, prolific. Fruit medium, greenish-yellow with much russet, richly flavoured.

Baronne de Mello.—October–November. Frequently excellent, but variable in different soils and seasons. Tree of free growth on the Free stock, much more compact on the Quince, and very prolific. Fruit large, tapering, smooth, russet yellowish, rich and aromatic when at its best.

Beacon.—August. A handsome Pear for exhibition or market. Tree vigorous and erect in habit on the Free stock, succeeds best in gardens double-grafted on the Quince. Prolific. Fruit large, well-formed, brightly coloured, melting and sweet.

Belle Julie.—October. Excellent and extremely prolific; useful for gardens or market. Tree of moderate growth on the Quince, erect, and hardy. Fruit medium, even, rather tapering, brown or reddish-russet, juicy, sweet and aromatic.

Bellissime d'Hiver (fig. 928).—November–April. One of the best for stewing. Tree of strong growth, and forms a large pyramid on the Quince, or a good standard on the Pear. Fruit very large, roundish, green and brown, sweet and well-flavoured.

Bergamotte Cadette.—October–January. Of fine quality, suited for gardens or orchards. Tree very strong on the Free stock, prolific. Fruit medium, yellowish, with an abundant, rich, sweet, musk-flavoured juice.

Bergamotte de Millepieds.—October. A high quality variety for gardens. Tree of compact habit on the Quince, healthy, and fairly prolific. Fruit medium, round or turbinate, yellow with a little red, juicy and rich.

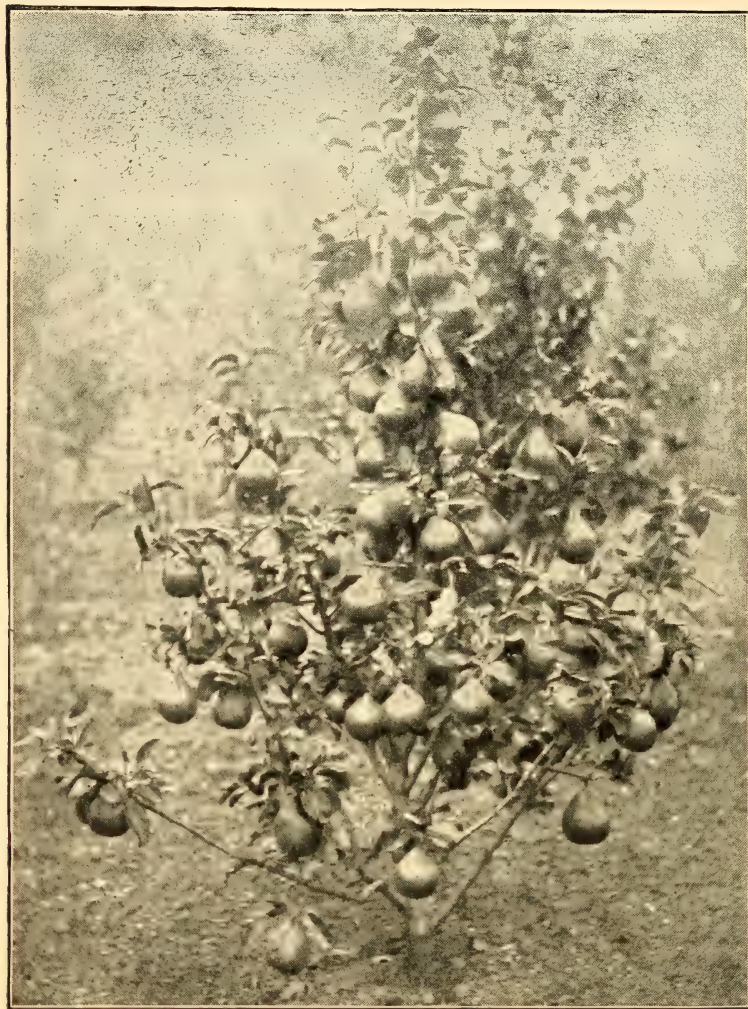


Fig. 929.—Bush Pear. Beurré Baltet Père.

gards the small highly-flavoured Pears an undue increase in size usually means a corresponding loss of quality.

The other terms used scarcely require an explanation, "pyriform" refers to the natural form of the Pear, somewhat conical and tapering, "oblong" indicates that the fruit is nearly of equal breadth at the apex and base, "obovate" that it is much broader at the eye than at the stalk, and "oval" or "ovoid" that it is nearly equally curved at both ends.

Alexandre Lambré.—November–December. Sometimes excellent, but variable; requires a warm position. Tree

Bergamotte Esperen.—January–April. An excellent variety for general garden use; needs the protection of a wall in cold positions. Tree of moderate growth as a pyramid on the Quince, fairly prolific. Fruit medium, roundish, uneven, melting, and richly flavoured.

Beurré Alexandre Lucas.—December. Handsome, good for general use and exhibition. Tree very strong and erect, forming a fine standard or strong pyramid on the Quince. Fruit medium, well-proportioned and even, melting, juicy, and refreshing.

Beurré Bachelier.—December. A hardy and prolific

variety, of moderate merit. Tree vigorous, forming a fine pyramid on the Pear and succeeding fairly well on the Quince. Fruit large and uneven, melting and rich at its best, but sometimes only second- or third-rate.

Beurré Baltet Père (fig. 929).—November. A fine exhibition Pear. Tree of moderate growth, thrives on the Quince, and forms good pyramids, espaliers, and cordons. Fruit large, turbinate, brightly coloured, juicy and rich.

Beurré Berckmanns.—November. Variable, in some situations excellent, in others second- or third-rate. Prolific and of good appearance for exhibition. Tree well

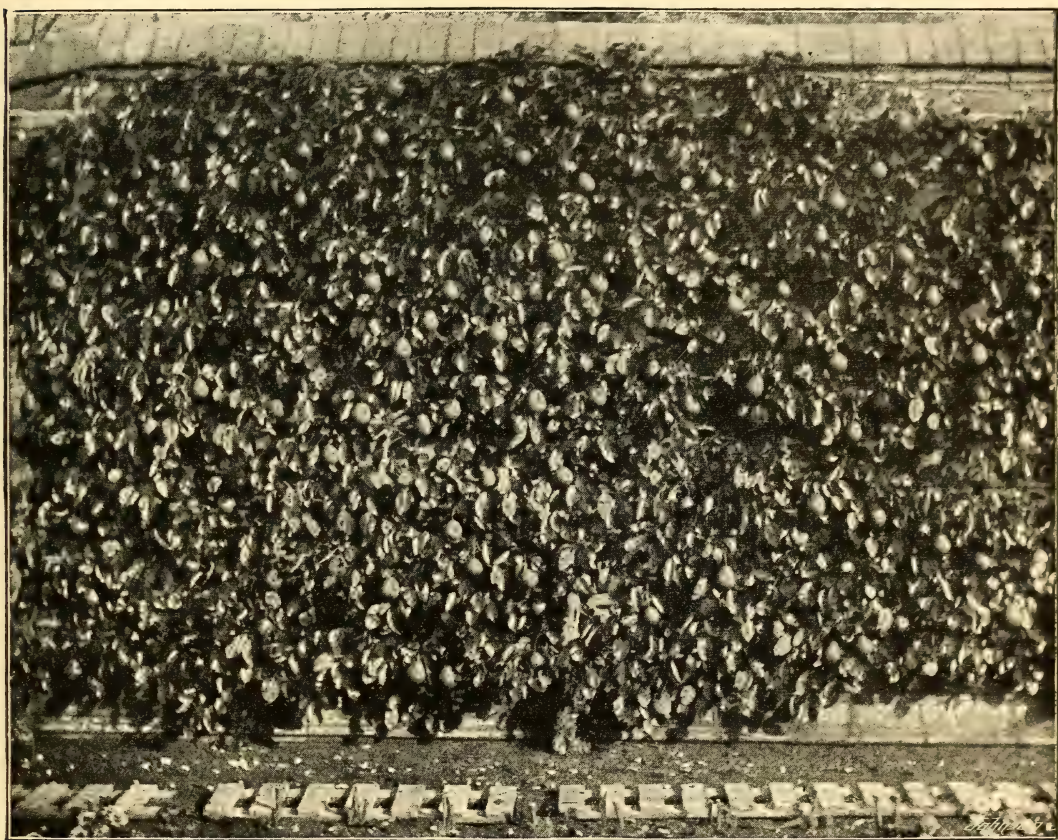


Fig. 930.—Pear-tree. *Beurré Diel*.

suited for growing in pyramid form, especially if double-grafted on the Quince. Fruit medium, pyriform, pale-yellow with russet, juicy and brisk.

Beurré Bosc.—October–November. Of high quality for garden use or exhibition. Tree of medium growth, and best fitted for the Quince when double-grafted. It then forms useful prolific pyramids or trained trees for walls. Fruit large, yellowish with russet, juicy and aromatic.

Beurré Capiaumont.—October. Useful and prolific for orchards, of second-rate quality. Tree strong and hardy, forming excellent standards on the Pear or small pyramids on the Quince. Fruit small to medium, yellowish with russet, firm as a rule, but sometimes melting and finely flavoured.

Beurré Clairgeau.—November. A handsome exhibition or market Pear of moderate quality. Tree vigorous, forming a fine standard or large prolific pyramid on the Quince. Fruit large and long, curved, yellow with bright-red, juicy with a slight aroma.

Beurré d'Amanlis.—September. One of the most prolific and useful of the early varieties. Tree of vigorous, healthy, somewhat spreading growth, succeeding equally well on both Free and Dwarfing stocks, but coming into bearing earlier as a pyramid on the latter. Fruit large, pyriform, green and reddish-brown. Juicy, sweet, and perfumed.

Beurré d'Anjou.—October–December. A fine exhibition Pear of good constitution, often succeeds where many others fail. Tree of healthy growth, admirably adapted for the Quince as a pyramid, espalier, or cordon. Fruit large, roundish, yellowish with russet, juicy with a slight aroma.

Beurré d'Arenberg.—December–January. Often compared with Glou Morgeau, but quite distinct, and usually inferior to it. Tree of free growth on both stocks, and prolific in suitable situations. Fruit medium, yellowish, juicy and aromatic at its best, but sometimes acid and second-rate.

Beurré de Jonghe.—December–February. Of the

highest quality, excellent for gardens, especially on walls. Tree of moderate growth on the Quince, but usually fertile if double-grafted on a good intermediate stock. Fruit medium to large, pyriform, yellowish, with an abundant richly aromatic juice.

Beurré de l'Assomption.—August. Chiefly valued for its earliness, but sometimes disappointing in quality.

Beurré Fouquieray (fig. 931).—October. A useful and handsome exhibition Pear. Tree hardy, vigorous, and prolific on the Quince, cropping regularly in any form; also forms a good tree on the Pear stock. Fruit large, obovate, yellowish with russet, of moderately good flavour.

Beurré Giffard.—August. Useful, early, and of good quality. Tree of somewhat loose and spreading habit,

very prolific on the Quince; well-adapted for the bush form of growth. Fruit medium, turbinate, yellowish, melting, with a pleasant aroma.

Beurré Goubault.—September. Prolific, early, of good quality if gathered early and used at once. Tree of moderate growth, most useful on the Quincestock. Fruit small to medium, roundish, melting and slightly aromatic at its best.

Beurré Hardy (fig. 932).—October. Excellent in constitution and quality. Tree of free growth, forming fine pyramids on the Free stock, or strong and fertile bushes on the Quince. Fruit large, obovate, yellowish with russet, juice abundant and rich, very distinct and refreshing.

Beurré Langelier.—Somewhat delicate, but of high quality, generally best when grown on a wall. Tree of moderate growth when double-grafted on the Quince as a pyramid, espalier, or cordon, and fairly prolific. Fruit medium, pyriform, uneven, yellowish and bright-red, buttery, and peculiarly rich when fully matured.

Beurré Lefebvre.—October. Of high quality, but not much grown. Tree of medium growth, best on the Quince stock as a pyramid or cordon. Fruit large, roundish, yellow with russet, sweet and very rich.

Beurré Mortillet.—September–October. Handsome, of good quality, suitable for general use or exhibition. Tree free and vigorous on the Pear

stock, not satisfactory on the Quince unless double-grafted, when excellent pyramids, bushes, espaliers, and cordons can be formed. Fruit large, richly coloured, yellow and red, melting with an agreeable flavour. It must be gathered before fully ripe.

Beurré Rance (fig. 933).—January–March. Of high quality, late, and of good constitution. Tree free, vigorous, forming large prolific standards on the Pear stock; but usually grown in gardens double-grafted on the Quince either as a pyramid or as a wall tree. Fruit large, even, pyriform, greenish-brown, buttery and juicy, peculiarly rich.

Beurré Six.—October–November. Variable, of fine quality in some situations. Tree of strong growth both on Pear and Quince, more reliable on the latter. Fruit large, pyriform, irregular, green and russet, with abundant juice, sweet and pleasant at its best.



Fig. 931.—Bush Pear. *Beurré Fouquieray*.

Tree of moderate but rather irregular growth, best suited for the Quince as a bush pyramid or trained tree. Fruit large, pale-yellowish, rich and musky at its best, otherwise rather tasteless.

Beurré Diel (fig. 930).—October–November. An excellent all-round Pear. Tree very strong, and prolific in all forms on the Quince; well-adapted for walls in cold districts; also fine as a standard in the warmer counties. Fruit large, green or yellow with russet, melting, of aromatic flavour. Largely imported from France under the name of *Beurré Magnifique*.

Beurré Dumont.—October. A handsome Pear for garden use or exhibition. Tree of moderate growth, best suited for the Quince stock either as pyramid, espalier, or cordon. Fruit large, round or obovate, greenish with russet, melting, sweet and rich.



Fig. 932.—Pyramid Pear. *Beurré Hardy*.

Beurré Sterckmans.—December–January. Useful, handsome, and of fine quality. Tree of free growth, forming a large pyramid on the Pear, but most useful on the Quince either as espalier or cordon. Fruit medium, pyriform, green and red, melting, sweet, richly aromatic when in perfection.

Beurré Superfin.—September–October. Excellent, of hardy constitution, prolific, and of high quality. Tree of robust but moderate growth, best on the Quince stock, forming a fertile well-shaped pyramid, espalier, or cordon for a wall. Fruit medium to large, obovate, yellow with much russet, melting, rich, with a distinct aroma.

Bishop's Thumb.—October–November. Useful as an orchard standard, very prolific, and though an old variety, still in demand for certain markets. Tree vigorous on the Free stock, double-grafted on the Quince; it forms a compact pyramid usually very fertile. Fruit medium, long and narrow, yellowish with abundant russet, juicy, rich, and aromatic.

lowish with abundant russet, juicy, rich, and aromatic.

Black Worcester.—November–February. A useful culinary variety, one of the oldest; it is the Warden Pear of Parkinson's "Paradise". Tree very strong, forming a large standard on the Free stock, to which it is best suited. Fruit very large, obovate, green and brown with a slight reddish tint, rather coarse, but of good flavour when cooked.

Bonne d'Ézée.—October–November. Handsome at its best, a favourite exhibition Pear; also known as Brockworth Park. Tree of moderate growth, prolific on the Quince; forms useful cordons for walls. Fruit large, pyriform, yellow russet, melting and pleasantly flavoured at its best, but it does not succeed in cold or wet situations.

British Queen.—October. Uncertain and variable, occasionally of high quality. Tree of moderate growth on the Quince, forming a useful pyramid or cordon. Fruit medium to large, pyriform, yellow and red, richly and briskly flavoured when at its best.

Broompark.—November–December. One of Knight's seedlings which is not much grown now, but is worthy of more attention. Tree of free growth, thriving on the Pear and Quince stocks. Fruit small, round, juicy, and richly flavoured.

Brown Beurré.—October. An old variety of good constitution and excellent quality; has been grown in England for over 200 years. Tree of moderate growth, very hardy, forms a well-developed pyramid or standard on the Free stock, but in gardens it generally gives more satisfaction when double-grafted on the Quince in any style for training to walls. Fruit large, obovate, green and brown, melting, sweet and richly flavoured.

Caillat Rosat.—August. Early and good when well grown. Tree very prolific on the Quince, of moderate growth. Fruit medium, pyriform, yellowish tinted with red, juice abundant and aromatic.

Calebasse Bosc.—October. Second-rate; sometimes thrives where few other Pears can be grown, and is then useful. Tree hardy and succeeding on both stocks, prolific. Fruit medium or large, long, pyriform, yellow

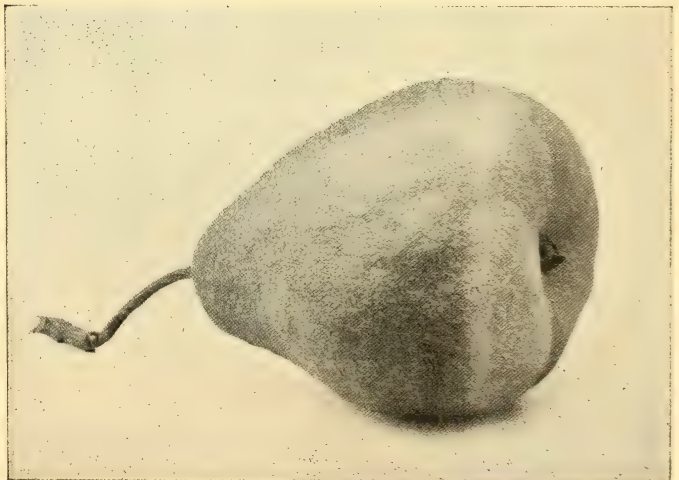


Fig. 933.—Pear. *Beurré Rance*.

russet, juicy and sweet with a slight aroma under the best conditions.

Calebasse de Bavay.—December. Chiefly valued for its fertility and hardiness. Tree of moderate growth on both stocks, very prolific on the Quince. Fruit medium, long and curved, yellowish with russet, juice abundant and richly flavoured.

Caroline Hogg. November–December. Excellent in warm soils. Tree of free growth, best on the Quince. Fruit small to medium, roundish, yellow and abundant russet, melting and richly aromatic.

Catillae (fig. 934).—December–April. One of the best culinary Pears. Tree strong and very hardy, thriving



Fig. 934.—Pear. *Catillae*. (4.)

on the Pear, and usually fairly prolific. Fruit very large, roundish, green with red, crisp, and slightly perfumed with musk.

Catinka.—December. Variable, but excellent in some warm soils. Tree of free growth on both stocks. Fruit medium, long and conical, yellow with russet, very sweet when fully ripe, slightly aromatic.

Chaptal.—December–April. A useful culinary Pear of good constitution. Tree of free growth, excellent and prolific as a standard. Fruit large, obovate, greenish-yellow with reddish-brown, sweet with a pleasant aroma.

Chaumontel.—November–March. An old variety, rather uncertain; should be grown in warm, rich soils, when it is excellent. Tree of strong growth and prolific, forming a large standard on the Pear; good on the Quince for espalier, and cordon for a wall. Fruit medium to large, uneven, yellow, melting, and richly aromatic.

Citron des Carmes.—July–August. Valuable in the south for its earliness, quality, and fertility, but in Scotland it is surpassed by Crawford. Tree hardy, and especially prolific on the Quince when double-grafted, though it forms only a small tree; standards of moderate size can be had on the Free stock. Fruit small to medium, roundish or obovate, yellowish, with a plentiful sugary juice.

Clapp's Favourite.—August. A favourite for market and exhibition; of American origin. Tree of vigorous growth on the Free stock; seldom succeeds on the Quince unless double-grafted, when it is very fertile. Fruit medium, rather long, green, yellow and bright crimson,

juicy and briskly flavoured; must be gathered for sale before it is quite ripe, or for use direct from the tree.

Colmar.—November–February. An old but excellent variety worthy of the best attention. Tree of vigorous growth on the Pear stock; most satisfactory in the form of an espalier or cordon on a wall. Fruit medium, green and russet, melting, and richly aromatic.

Colmar d'Été.—September. Excellent, of good constitution and prolific in warm soils. Tree of strong growth, hardy; thrives on both Free and Dwarfing stocks; especially fine in the pyramidal form. Fruit small, roundish, yellow with red spots, juicy, sweet, and aromatic.

Comte de Flandre.—November–December. Of high quality, but requires special treatment. Tree of free healthy growth on the Pear, but slow in bearing; should be double-grafted on the Quince, and treated generously to ensure the best results. Fruit large, long, yellowish with russet, juicy, and rich.

Comte de Lamy.—October. Excellent in warm soils and on the right stocks. Tree of free growth, and prolific if double-grafted on the Quince; also good as a standard on the Pear, but the fruit is not so fine or rich. Fruit small to medium, roundish, yellowish with russet, melting, sweet, and aromatic.

Conference.—November. Valuable either for garden or orchard, a favourite for exhibition and market. Tree vigorous and hardy, forming a strong standard or pyramid. Prolific in different forms on the Quince. Fruit large, pyriform, green with russet, melting, and richly flavoured in its best condition.

Crasanne.—November–December. Good in warm soils, unreliable in cold situations. Tree hardy and healthy on the Free stock, but best when double-grafted on the Quince and trained to a wall, though rarely very prolific. Fruit medium, rounded, yellow with some russet, sweet, and aromatic.

Crawford.—August. Useful and early in Scotland. Tree of free healthy growth and prolific. Fruit small, rounded, yellow and reddish, melting, and of pleasant flavour.

Dana's Hovey.—November–January. An American Pear, very satisfactory in England on warm soils and in sunny situations. Tree of moderate growth, preferably double-grafted on the Quince. Fruit small, rounded or obovate, yellowish-green with russet, melting, and aromatic; in its perfection it is delicious.

Delices d'Hardenpoint.—November. Of high quality, tender; should only be grown in the most favoured situations. Tree of moderate growth, forming a compact standard; best on the Quince, and trained to a wall. Fruit medium to large, oblong, pale-yellow, melting, and finely flavoured.

De Maraise.—October. Of high quality, but little known in England. Tree of moderate growth on both stocks. Fruit medium, rounded, even, yellow and flushed-red, very juicy, sweet, and rich.

Désiré Cornélis.—August–September. Excellent; by some preferred to Williams' Bon Chrétien, but is less fertile. Tree healthy and free on both Pear and Quince. Fruit medium to large, oblong, greenish-yellow with russet, flavour rich and wine-like.

Deux Sœurs.—October–November. One of the best in warm soils. Tree very strong and healthy, forms a handsome pyramid on either stock, extremely prolific on the Quince. Fruit large, pyriform, and irregular, yellowish or green with a little russet, juicy, and with a richly vinous flavour.

Directeur Alphand.—February–May. A fine Pear for baking, valued also for exhibition. Tree moderate in growth, forming a compact pyramid on either Pear or Quince. Fruit very large, long, green with a little



Fig. 935.—Pear. Doyenné du Comice. (½.)

russet, sweet, and aromatic, but needs full exposure to the sun to ripen it properly.

Directeur Hardy.—October–November. Handsome, of good quality. Tree vigorous, hardy; remarkably prolific on the Quince in pyramid or cordon form. Fruit large and even, melting, juicy, and richly flavoured.

Dr. Jules Guyot.—September. Handsome, reliable, and prolific, of the Williams' Bon Chrétien type; serviceable for market. Tree hardy and vigorous as a standard, forms a compact pyramid or bush on the Quince. Fruit large, yellowish with slight colour, melting, and sweet.

Doyenné Boussoch.—October–November. Handsome, prolific, variable, a favourite for autumn exhibitions. Tree rather loose in habit, strong, forming a large standard; better as a bush on the Quince in favourable soils. Fruit very large, obovate, yellow with russet, juicy when fresh, but soon loses all merit.

Doyenné d'Alençon.—December–February. A useful winter Pear of light quality. Tree of strong growth, well adapted for the pyramidal form on either stock, especially prolific on the Quince, attains perfection against a wall. Fruit medium, ovoid, green and yellow with russet, melting, and richly aromatic.

Doyenné Defays.—October–November. Of high quality and reliable character. Tree hardy, free in growth, and fertile on the Quince. Fruit small to medium, yellow with russet, rich, sugary, and finely aromatic.

Doyenné d'Été.—July. One of the first to ripen in England; the fruit is of good quality if gathered before it changes colour. Tree of hardy and free growth, requires to be double-grafted on the Quince, when it forms a fertile pyramid. Fruit small, rounded, pale-yellow with slight-red tint, juicy and refreshing.

Doyenné du Comice (figs. 935, 936).—November–December. Rightly described as "the best Pear", for in constitution, fertility, and quality it is unsurpassed, and it is valuable to growers of all classes. Tree healthy and free in growth, forming a handsome pyramid on either stock; prolific as an espalier or cordon on the Quince for a wall. Fruit large, pyriform, yellowish-green with little russet, richly flavoured, melting, and juicy.

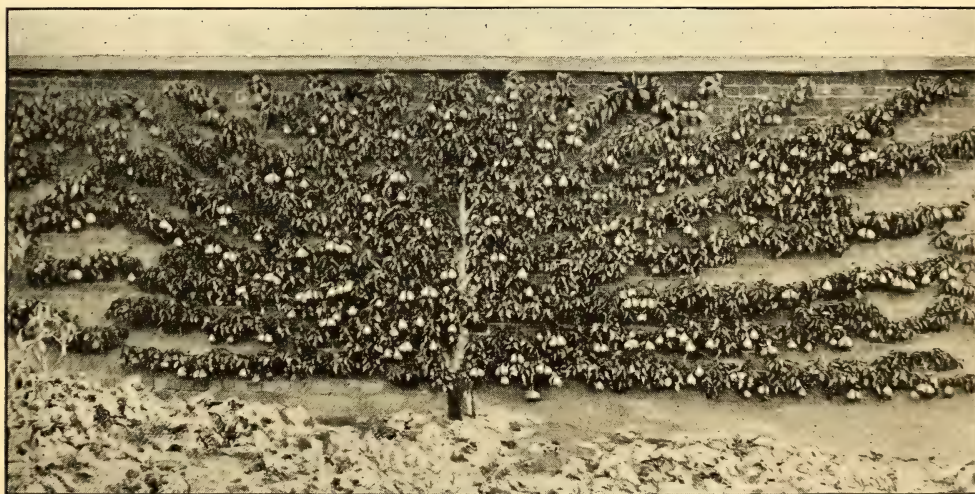


Fig. 936.—Pear Tree. Doyenné du Comice. Fan-trained. Grown at Madresfield Court.

Doyenné Goubault.—January. Prolific and of good quality. Tree of moderate strength but healthy, and equally good on either stock; forms a handsome fertile pyramid. Fruit medium, roundish, yellow with russet markings, melting, and richly aromatic.

Duc de Nemours.—December. Of high quality in warm soils. Tree of strong growth, succeeding on either stock, forms a strong pyramid moderately fertile on the

Quince. Fruit large, pyriform, even, and handsome, yellow with russet spots, buttery, and of delicious flavour.

Duchesse d'Angoulême.—October–November. A general favourite, being of excellent quality in suitable positions. Tree strong and healthy in growth, forming a handsome pyramid on either stock. Fruit large to very large, broadly obovate, yellow with some russet, buttery, and finely flavoured.

Duchesse de Bordeaux.—December–February. A good variety of excellent flavour, keeps well. Tree strong, grows well on either stock as a pyramid, bearing well and regularly if double-grafted on the Quince. Fruit small, somewhat rounded but irregular, pale yellow and russet, with an extremely rich aromatic flavour.

Duchesse de Mouchy.—February. Second-rate but good in constitution and habit. Tree vigorous, succeeding well as a pyramid on the Quince, prolific and constant. Fruit large, rounded, or oblate and even, yellow with russet, half melting, sweet, and slightly perfumed.

Durondeau.—October–November. Handsome, prolific, and useful either for exhibition or market. Tree strong, thrives either on the Free stock or the Quince, remarkably fertile and beautiful on the latter. Fruit large, long, even, smooth, russet and rich-red, tender, juicy, and rich.

Easter Beurré (fig. 937).—January–March. An excellent variety of the highest quality in warm rich soils and



Fig. 937.—Pear. Easter Beurré. (3.)

sunny situations. Tree of free growth, hardy, and prolific as an espalier or cordon on a wall when double-grafted on the Quince. Fruit large, obovate, yellowish with russet, buttery, and richly aromatic.

Emile d'Heyst.—October–November. Prolific, useful, and of good quality; the fruit must be gathered early, and does not keep many days after it is ripe. Tree very fertile on the Quince, but much stronger on the Pear. Fruit medium, pyriform, yellowish with abundant bright russet, melting, briskly flavoured and slightly perfumed.

Eyewood.—October–November. Variable in quality, but under the best conditions of exceptional merit. Tree of moderate growth, very hardy, and prolific when double-grafted on the Quince; useful for market. Fruit small, rounded, yellowish with russet, briskly aromatic or slightly acid, the juice abundant.

Fertility.—September–October. Noted for the character expressed in its name, very useful for market and orchards. Tree of free, healthy, hardy growth on either stock, more compact on the Quince, and extremely prolific, cropping with great regularity. Fruit medium, obovate, or oblong, bright reddish-brown, russet, juicy, sweet and aromatic at its best but always pleasant and refreshing.

Flemish Beauty.—September–October. Handsome, of fine quality, good for exhibition. Tree hardy, of moderate strength, fairly free on the Pear stock, more fertile and useful when double-grafted on the Quince. Fruit medium

to large, obovate, yellow with russet and crimson, melting and rich if gathered before it is fully matured.

Flemish Bon Chrétien.—November–March. A first-rate culinary variety. Tree vigorous and prolific on the Quince. Fruit medium, obovate, yellow with russet, sweet and pleasantly flavoured, keeps its character well until late in the season.

Fondante d'Automne.—September–October. Of the best quality and reliable. Tree vigorous on the Free stock, forming a good standard; it also succeeds well on the Quince as a pyramid or trained as an espalier or cordon for a wall. Fruit large, obovate, even, pale-yellow with a little russet, juicy, sweet, and refreshing, with a delicate perfume.

Fondante de Cuerné.—September. Considered superior to Beurré Giffard, but is uncertain, and in some soils and seasons is only second-rate. Tree of moderate strength, forming a good pyramid on either stock. Fruit medium to large, obovate, yellow, almost white, juicy, and slightly aromatic, sometimes rather dry and acid. Should be gathered early.

Fondante de Malines.—November–December. Excellent when at its best, but unreliable except in the warmest situations. Tree of good habit, moderately strong, adapted for both stocks, fairly prolific on the Quince. Fruit large, rounded, obovate, even, and handsome, much yellow with some crimson, melting, and with a sugary aromatic flavour. It must be gathered early as it soon decays.

Fondante de Thiriott.—November–December. Fine in quality and of good constitution. Tree of free growth, well suited for the Quince, on which it is prolific and reliable. Fruit large, obovate, melting, sweet, and aromatic.

Forelle.—November–February. Handsome and excellent, distinct in flavour, a great favourite with many. Tree moderately vigorous, requires to be double-grafted on the Quince to secure the best results. Fruit medium, even, and pyriform, greenish-yellow with dark crimson dots, buttery, sweet, and richly vinous. Commonly known as the "Trout Pear".

Franc Réal d'Hiver.—January–March. A late culinary Pear. Tree very strong and prolific, making a good standard on the Free stock, or a pyramid on the Quince. Fruit medium, pyriform, uneven, sweet, and aromatic, the flesh becoming richly coloured in cooking.

Gansel's Bergamot (fig. 938).—October–November. Of the highest quality when grown under the best conditions. Tree of moderate habit, an uncertain cropper as a pyramid, should be double-grafted on the Quince, and trained as an espalier or cordon on a wall. Fruit medium to large, rounded, yellow with a reddish tint, buttery, with a rich musky aroma. The flowers do not set freely unless other profuse flowering varieties are near.

Gansel-Seckle.—October–November. Usually of high quality, sometimes uncertain and second-rate. Tree of moderate growth, best on the Quince or double-grafted. Fruit small to medium, round, yellow with a slight crimson tint, richly aromatic in the way of Seckle, from which it was derived by a cross with Gansel's Bergamot.

General Todleben.—December–February. A fine old distinct variety when the fruit can be fully matured; good for culinary use or for exhibition. Tree of medium strength, but prolific on the Quince. Fruit very large, long, and pyriform, yellow with russet, sweet, and with a pleasant aroma.

Gilles-à-Gilles.—November–February. An old culinary Pear of considerable merit. Tree vigorous, forming a large

standard on the Free stock, preferable as a pyramid on the Quince, being then a prolific and early cropper. Fruit very large, rounded, yellow with a little russet, juicy, and well-flavoured.

Glou Morceau (fig. 939).—November–January. Excellent in warm situations and good soils. Tree of free growth on either stock; succeeds best on the Quince as a pyramid or bush, or as an espalier or cordon against the wall. Fruit medium to large, roundish or obovate, yellowish with a little russet, buttery, and richly aromatic.

Grégoire Bordillon.—September. Useful, early, and of fine quality. Tree strong and very prolific as a pyramid on the Quince. Fruit large, rounded, rich yellow with a little red, sweet, rich, and aromatic. This is one of the few varieties which the late Mr. R. D. Blackmore found thoroughly satisfactory where so many failed.

Hacon's Incomparable.—November–December. Excellent and of good constitution, prolific and reliable in all favourable situations. Tree of fine habit, free and healthy as a standard or as a pyramid on the Quince when double-grafted. Fruit medium, rounded, yellowish with russet, melting, musky, and rich at its best.

Hessle.—October. One of the best for orchards and market, hardy and reliable throughout Great Britain. Tree of strong growth, forming a large and prolific standard on the Free stock; can also be grown with profit as a pyramid on the Quince. Fruit small, pyriform, yellowish-green with russet, juicy, and possessing a sugary aromatic flavour.

Huyshe's Prince Consort.—October–November. In warm soils and on a suitable stock this is an excellent variety, but in unfavourable positions it is not worth growing. Tree of moderate strength, must be double-grafted on the Quince to ensure the best results. Fruit large, oblong, green or yellowish, sweet, and of distinct vinous flavour.

Huyshe's Prince of Wales.—October–November. A high-quality variety under favourable conditions, but

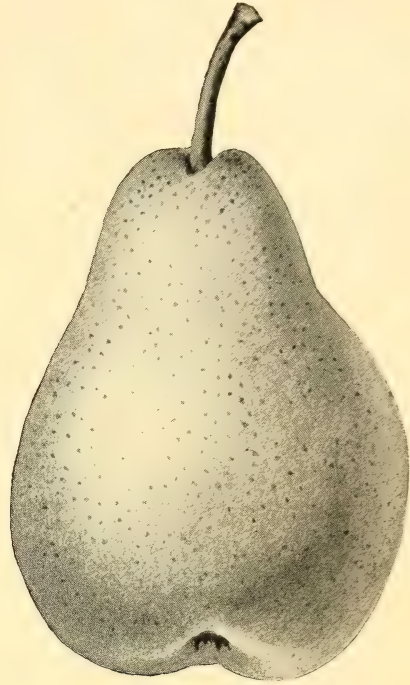


Fig. 939.—Pear. *Glou Morceau*. ($\frac{1}{2}$.)

Jargonelle.—August. A useful orchard Pear, hardy in all districts. Tree of free and slightly pendulous growth, forming a large prolific standard on the Free stock; does not usually succeed on the Quince unless double-grafted. Fruit medium to large, long, pyriform.

Jean de Witte.—January–March. Useful and of good quality. Tree of strong and healthy habit, forming a fine fertile standard; well suited for the Quince in pyramidal form if double-grafted; gives good results trained on a wall. Fruit small to medium, rounded or obovate, yellow with a little russet, buttery, and richly aromatic.

Jersey Gratioli.—October. Excellent. Tree of moderate growth, good either as a standard on the Free stock or as a pyramid or espalier on the Quince; is usually prolific. Fruit medium, roundish, yellow and brown with russet; of wine-like flavour.

Joséphine de Malines.—December–March. Late, of high quality. Tree of good habit, healthy and free, does well on the Pear stock as a standard or pyramid, also as a bush on the Quince, especially when double-grafted, being then both prolific and excellent. Fruit medium, pyriform, yellowish-green tinged with red, sweet, rich, and perfumed.

King Edward's.—September–November. Remarkable for the great size of the fruit and its hardness. Tree of free hardy growth as a standard on the Pear stock; requires to be double-grafted to succeed on the Quince. Fruit extremely large, pyriform, green or yellow with a reddish tint, juicy and slightly aromatic, but not of high quality.

Knight's Monarch.—December–January. A fine variety but variable; can only be depended upon in the warmest soils and best positions. Tree of strong growth, develops

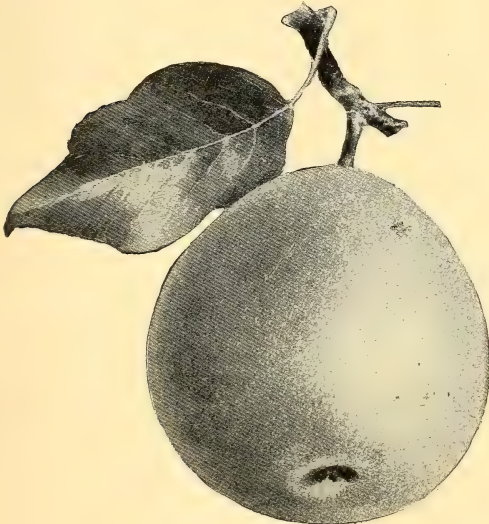


Fig. 938.—Pear. *Gansel's Bergamot*. ($\frac{1}{2}$.)

uncertain. Tree of moderate growth, irregular in cropping unless double-grafted on the Quince and trained as an espalier or cordon on a wall. Fruit large, yellow with abundant russet, melting, with a rich Bergamot aroma.

well as a pyramid on the Pear; is best double-grafted on the Quince, either as a pyramid, espalier, or bush for a wall. Fruit medium, rounded or oblate, yellowish with much russet, juicy, sweet, and with a distinct aroma,



Fig. 940. Pear. Madame Millet. (3.)

Le Lecvier.—January–March. A late variety of recent introduction, very promising. Tree of moderate vigour, does well as a bush or pyramid on the Quince, being fairly prolific but not a heavy cropper. Fruit large, pyriform, juicy, and richly flavoured.

Léon Leclerc de Laval.—January–May. A late culinary variety, sometimes suitable for dessert. Tree of very strong growth, forming a vigorous pyramid on the Quince, and usually prolific. Fruit large, long, pyriform, yellowish with slight russet, sweet and pleasantly flavoured.

L'Inconnue.—February. A good late variety. Tree of moderate growth on the Quince as a bush or pyramid. Fruit medium to large, pyriform, yellowish with russet, sweet, and richly aromatic.

Louise Bonne of Jersey.—October. A very valuable and popular pear for gardens and market. Tree of free growth on the Quince, forming a well-developed and prolific pyramid. Fruit medium, pyriform, yellowish with crimson dots and tints, melting and richly vinous, very distinct and excellent.

Madame André Leroy.—October. Of high quality and fertile. Tree moderately vigorous, equally good on either stock, but most serviceable as a pyramid on the Quince. Fruit medium to large, oval, even, yellowish with much russet, melting, sweet, and richly aromatic.

Madame Millet (fig. 940).—March–May. A late and deliciously melting variety of handsome appearance. It succeeds well on the Quince, and is improved by being grown against a wall. Does well as a pyramid, and is good as a cordon.

Madame Treyve.—September. Prolific and of high quality. Tree of moderate growth on the Quince in bush form. Fruit large, pyriform, yellow with slight russet and crimson tint, melting, and finely flavoured.

Magnate.—October–November. One of the Sawbridge-worth seedlings of good quality. Tree of free healthy growth, forming a good pyramid on the Quince. Fruit large, pyriform, rich brown russet, handsome, melting, and with a rose-water aroma.

March Bergamot.—February–March. Late, of high quality. Tree vigorous and hardy; should be grown as a

standard on the Free stock, as an espalier for a wall on the Quince. Fruit small to medium, rounded, brown with russet, of exceptionally rich aromatic flavour.

Maréchal de Cour.—October–November. Excellent in quality, hardness, and fertility. Tree of vigorous growth well suited for the Pear stock as a standard or pyramid; equally good and more prolific on the Quince. Fruit large, pyriform, yellow with abundant bright russet, buttery, and richly flavoured.

Marguerite Marillat (fig. 941).—September. A new variety of considerable merit for garden and exhibition, prolific and hardy. Tree erect and compact, forming a shapely bush or pyramid on the Quince. Fruit large, pyriform, even, brightly coloured, and richly aromatic.

Marie Benoist.—November–January. A popular late garden and exhibition variety. Tree of free growth on the Pear, more fertile and useful when double-grafted on the Quince and grown as a pyramid, espalier, or cordon. Except in the best situations it should be grown against a wall. Fruit large, rounded, yellowish with much russet, melting, and highly flavoured.

Marie Guisse.—February. A late variety of high quality in the most favourable positions. Tree of moderate growth, not satisfactory on the Quince except it be double-grafted, when it is both fertile and of good quality. Fruit large, long, and pyriform, yellow and reddish, juicy, rich, and slightly aromatic.

Marie Louise.—October–November. One of the best. Tree of strong growth as a standard on the Free stock; productive when well established, more useful in gardens when double-grafted on the Quince and trained as pyramid, espalier, or cordon. The protection of a wall is

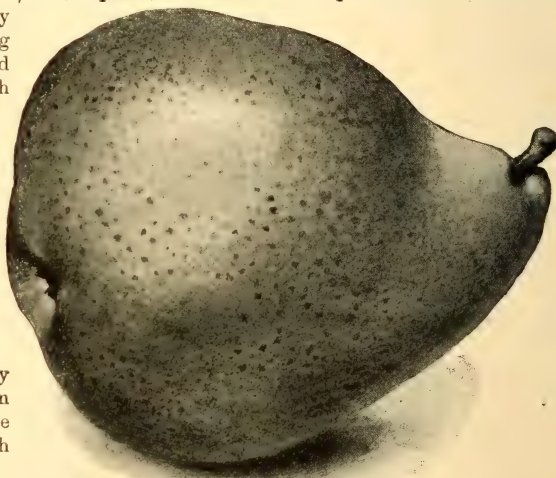


Fig. 941.—Pear. Marguerite Marillat. (3.)

essential in some districts. Fruit medium to large, pyriform, even, yellow and slight russet, buttery, and richly vinous.

Marie Louise D'Uccle.—October. Prolific and hardy, suitable for the orchard, a good market Pear. Tree extremely vigorous, forming a fertile pyramid on the Quince. Fruit large, pyriform, covered with bright russet, juicy and sweet, but seldom highly flavoured, often insipid.

Mariette de Millepieds (fig. 942). March–April. A first-rate late variety in some seasons. Fruit medium, roundish-obovate, green-yellow with brown russet; flesh white, melting, sweet, and juicy. Does best on the Quince and against a south wall.

Muirfowl's Egg.—October. A useful and popular Scottish variety. Tree strong and hardy, developing into a fine standard or pyramid on the Free stock. Fruit medium, rounded, yellowish-green with russet, sweet and slightly aromatic.

Napoléon.—November–December. Hardy and fertile, frequently successful where others fail, but seldom first-rate. Tree of vigorous growth, forming a large standard on the Quince; or it can be trained as an espalier against a wall. Fruit large, pyriform, even, yellowish, extremely juicy, and sometimes both sweet and rich.

Nec Plus Meuris.—January–March. Of high quality, late, moderately fertile. Tree very strong in habit on the Free stock, healthy and compact when double-grafted on the Quince; requires the shelter of a wall in many dis-



Fig. 942.—Pear. *Mariette de Millepieds*. (3.)

tricts. Fruit medium, rounded, irregular, yellow and russet, buttery, and richly vinous in flavour.

Nouveau Poiteau.—November. A good Pear usually, but variable in merit in cold districts. Tree of moderate vigour on either stock, forming a handsome pyramid. Fruit large, oval or obovate, yellow with bright russet, very sweet and fragrant.

Nouvelle Fulvie.—November–February. Excellent in good soils and a warm situation, otherwise variable. Tree of moderate growth, thriving on the Quince, good as an espalier on a wall. Fruit medium, pyriform, yellow covered with russet and tinted red, richly aromatic at its best.

Olivier de Serres.—February–March. Of excellent quality when in perfection. Tree of vigorous growth on either stock, forming a large standard or pyramid. Trained against a wall it gives good results. Fruit medium, rounded, yellowish with bright russet, buttery, and richly vinous.

Passe Colmar.—November–December. Valuable on good soil in a warm district. Tree very strong, forming a good prolific standard; on the Quince it forms a compact pyramid, also useful as an espalier or cordon on a wall. Fruit medium, obovate, pale-yellow and reddish, melting, and rich, with a vinous aroma.

Passe Crasanne.—January–March. Variable, excellent in the best districts. Tree of moderate strength, succeeding on either stock, forming a compact pyramid on the

Quince. Fruit medium, rounded, yellow covered with russet, rich and vinous.

Pitmaston Duchess.—October–November. One of the most handsome Pears grown, valuable for gardens and the best markets. Tree of vigorous free growth, forming a prolific pyramid or bush on the Quince. Fruit large, long, even, yellow with a little russet, melting and richly flavoured when well ripened.

Président Barabé.—December–February. A recently-introduced late variety of distinct merit. Tree of moderate growth, forming a useful, hardy, and prolific pyramid on the Quince; suitable for training as an espalier or cordon for a wall. Fruit medium to large, pale-yellow, melting, and aromatic.

Président d'Osmonville.—October–November. Of high quality, suitable for garden or orchard house. Tree moderately vigorous, forming a compact bush or pyramid on the Quince. Fruit medium to large, long, yellow, melting, and with a rich aroma of the Bergamot type.

Princess.—October–December. A seedling from Louise Bonne of Jersey, an excellent, handsome, and favourite Pear. Tree of free growth and erect in habit, forming a fine pyramid on the Pear stock, prolific on the Quince. Fruit large, pyriform, yellow with the colouring of the parent, melting, sweet and pleasantly flavoured.

Red Doyenné.—October–November. Useful and of fine quality. Tree of moderate growth, succeeding on either stock. Fertile on the Quince as a pyramid, or trained against a wall. Fruit medium, obovate, yellow with some russet, melting, and richly flavoured if gathered early.

Rousselet de Rheims.—September. An old, prolific, and excellent Pear. Tree strong, thriving on either stock, forming an excellent standard or pyramid. Fruit small, oval, even, yellow with a little russet, sweet, and with a fine aroma.

Royale d'Hiver.—December–January. Distinct in flavour, keeps late under favourable conditions. Tree of moderate growth, forms a fine standard or pyramid on the Pear stock; rather loose in growth on the Quince, is improved by double-grafting. Fruit large, pyriform, juicy with a musky aroma, which is much richer in fruits from wall trees.

Saint Germain.—November–January. Very old, but a favourite where soil and situation suit it. Tree of moderate growth, best when double-grafted on the Quince and trained as an espalier or cordon on a wall. Fruit large, oblong, green or yellow, melting, sweet, and brisk.

Seckle (fig. 943).—October. One of the oldest of American Pears, excellent in all respects. Tree vigorous, forming a handsome standard or pyramid on the Free stock; requires to be double-grafted on the Quince. Fruit small, rounded, and even, brownish with rich-red colouring, juicy, and with an exceptionally fine aroma.

Soldat Laboureur.—October–November. Variable, but excellent in a good soil and warm situation. Tree of moderate vigour, well suited to the Quince stock in the pyramidal form. Fruit medium to large, yellow with slight russet, melting, and richly flavoured in its best condition, but sometimes slightly acid.

Souvenir du Congrès.—August–September. A favourite exhibition Pear, being of handsome appearance and good quality. Tree fairly strong as a standard on the Free stock; does not succeed on the Quince unless double-grafted. Fruit long, obovate, yellow with bright russet and crimson streaks, melting, and richly aromatic.

Suffolk Thorn.—October. A seedling from Gansel's Bergamot; of fine quality under the best conditions, but variable. Tree of robust growth on the Pear stock;

must be double-grafted to succeed on the Quince. Fruit medium, roundish, yellow with a little russet, melting, and finely flavoured like its parent when in true character.

Summer Beurré d'Arenberg.—September. Of excellent quality, early. Tree of moderate growth, forming a compact and shapely pyramid on the Quince. Fruit

of vigorous but loose growth on the Free stock; very prolific on the Quince in any form. Fruit large, obovate, yellow or russet, melting, and highly flavoured with musk.

Triomphe de Vienne (fig. 944).—September. Handsome, early, of good quality, useful for gardens and exhibition. Tree of vigorous habit, very prolific when double-grafted on the Quince. Fruit large, even, and pyriform, yellow with some russet, juicy, and richly flavoured.

Urbaniste.—October. Excellent in good soils and on the right stocks. Tree moderately strong, developing into a fine pyramid on the Pear stock; more satisfactory as regards cropping on the Quince. Fruit medium, obovate, yellow with russet and a red tint, melting, and richly sweet with a pleasant aroma.

Uvedale's St. Germain.—January–April. A remarkable culinary Pear, one of the largest grown; frequently seen of enormous size in the London markets as *Belle de Jersey* and *Belle Angevine*. Tree vigorous as a pyramid on the Free stock, but it also succeeds well double-grafted on the Quince. Fruit of great size, often exceeding 2 lbs., pyriform, yellowish with a slight red tinge, juicy, and pleasantly flavoured.

Van Mons Léon Leclerc.—November. A handsome and excellent Pear. Tree vigorous, forming a large and useful standard; requires to be double-grafted on the Quince, and grown as a pyramid or against a wall. Fruit large, long, pyriform, green and yellow with russet, juicy, and richly vinous.

Verulam.—January–March (fig. 945). One of the best culinary Pears. Tree vigorous, good as a standard or pyramid on the Free stock; also very prolific on the Quince. Fruit large, green and russet, distinct in appearance,

being of a dull dark tint; it is of a fine colour and flavour when baked or stewed.

Vicar of Winkfield.—November–January. Principally used for culinary purposes, but good enough in some seasons for dessert. Tree strong, does well on the Free stock as a pyramid; also in any form on the Quince, being much used as an intermediate stock. Fruit large, long, yellow tinted with red, juicy, and aromatic.

Vineuse.—September–October. Distinct, and of high quality. Tree of moderate growth, succeeds in any form on the Quince. Fruit small to medium, oval or pyriform, yellow with a little russet, melting, and richly aromatic.

White Doyenné.—September–October. Early, of good constitution, and very fertile in any form. Tree vigorous, does well on either stock; but the largest and best coloured fruits are obtained from pyramids or wall-trees



Fig. 943.—Prolific Branch of Pear Seckle.

small, roundish or pyriform, juicy and melting, with a rich flavour of musk.

Swan's Egg.—October. An old but prolific, excellent variety when at its best. Tree healthy, of free growth; very fertile on the Quince. Fruit small or medium, round, yellow with much russet and some red colouring, juicy, with a distinct and pleasing flavour.

Thompson's.—November. Excellent, and of good constitution. Tree of vigorous growth; good as a standard or pyramid on the Pear stock; is frequently double-grafted on the Quince, as it thus comes into bearing soon, and the fruit develops its best qualities. Fruit medium, obovate, yellow with a few russet dots, melting, and finely aromatic.

Triomphe de Jodoigne.—November–December. A handsome winter variety, usually of good quality. Tree

on the Quince. Fruit medium, roundish, even, green or yellowish occasionally tinted with red, of a sweet vinous flavour at its best, but sometimes rather acid or insipid.



Fig. 944.—Pear. Triomphe de Vienne. (½.)

Williams' Bon Chrétien.—August–September. A most popular and useful Pear, more largely grown than any other variety in Europe, America, and South Africa. Tree of free but rather loose growth, forming a large

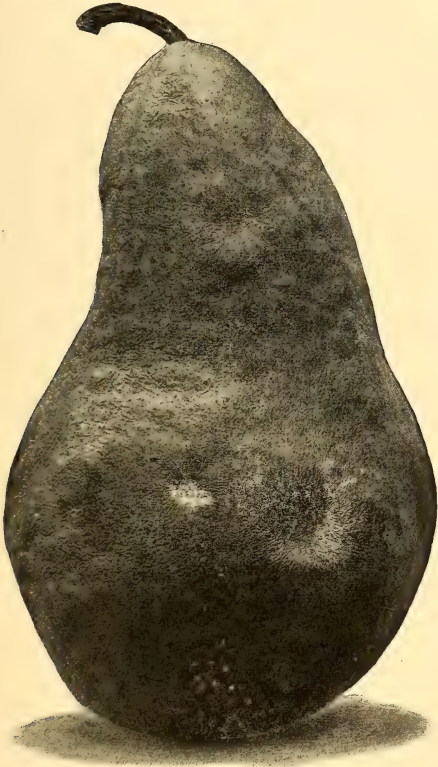


Fig. 945.—Pear. Verulam. (½.)

pyramid on the Free stock, but does not crop regularly; on the Quince it is straggling but prolific. Fruit large, pyriform, uneven, yellow with red streaks, juicy, and richly flavoured. Should be gathered before it is ripe.

Windsor (fig. 946).—August. An old and handsome Pear, but of such short duration that it is little grown. Tree of vigorous symmetrical growth, forming a handsome standard tree on the Free stock. Fruit large, even, and

pyriform, yellow and green with bright-red streaks, melting, and of pleasant flavour if gathered before it changes colour.

Winter Nelis.—December–February.—Excellent where it succeeds. Tree of moderate growth, forming a compact pyramid on the Quince, and does well when trained on a wall. Fruit small, roundish, green and yellow with russet, remarkably rich, aromatic, and sweet.

Zéphirin Grégoire.—December–January. Of high quality. Tree of free growth, developing into a fine pyramid on the Pear stock; much more prolific and reliable when double-grafted on the Quince. Fruit of medium size, round, yellow with russet, juicy, and vinous.

LIST OF SYNONYMS.

The following are the synonyms under which the Pears in the foregoing list most frequently appear:—

Albertine, see Doyenné Boussoch.
Alexandrine Helie, see Belle Julie.
Arbre Superbe, see Fondante d'Automne.
Aurore, see Beurré Capiaumont.
Bartlett, see Williams' Bon Chrétien.
Beau Présent, see Jargonelle.
Belle Alliance, see Beurré Sterckmans.
Belle Angevine, see Uvedale's St. Germain.
Belle de Berri, see Vicar of Winkfield.
Belle de Flandres, see Flemish Beauty.
Belle de Jersey, see Uvedale's St. Germain.

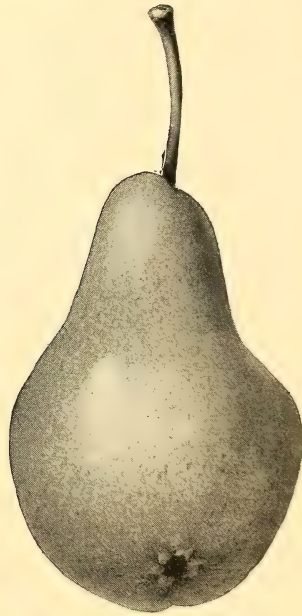


Fig. 946.—Pear. Windsor. (½.)

Bellissime, see Windsor.
Bell Pear, see Catillac.
Benedictine, see Brown Beurré.
Bergamot, see Autumn Bergamot.
Bergamotte Tardive, see Colmar.
Beurré d'Anglaise, see Easter Beurré.
Beurré d'Apremont, see Beurré Bosc.
Beurré d'Argenson, see Passe Colmar.
Beurré d'Avranches, see Louise Bonne of Jersey.
Beurré de Cambron, see Glou Morceau.
Beurré d'Esperen, see Emile d'Heyst.
Beurré d'Hardenpoint, see Glou Morceau.
Beurré d'Hiver, see Chaumontel.
Beurré de la Pentecôte, see Easter Beurré.
Beurré de Malines, see Winter Nelis.

Beurré de Mérode, see Doyenné Boussoch.
Beurré de Mortefontaine, see Beurré Lefebvre.
Beurré Deschamps, see Beurré d'Aremberg.
Beurré des Orphelines, see Beurré d'Aremberg.
Beurré Gris, see Brown Beurré.
Beurré Magnifique, see Beurré Diel.
Beurré Noisette, see Duc de Nemours.
Beurré Quetelet, see Comte de Lamy.
Beurré Royal, see Beurré Diel.
Bishop's Tongue, see Bishop's Thumb.
Bon Chrétien de Rans, see Beurré Rance.
Bonne Rouge, see Gansel's Bergamot.
Bon Papa, see Vicar of Winkfield.
Brockworth Park, see Bonne d'Ezée.
Cadette, see Bergamotte Cadette.
Chartreuse, see Catillac.
Chopine, see Jargonelle.
Colmar Gris, see Passe Colmar.
Common Bergamot, see Autumn Bergamot.
Conseiller de la Cour, see Maréchal de Cour.
Curé, see Vicar of Winkfield.
D'Auch, see Colmar.
De Fosse, see Jargonelle.
De Tongre, see Durondeau.
Dingler, see Comte de Lamy.
Doyenné Blanc, see White Doyenné.
Doyenné d'Automne, see Red Doyenné.
Doyenné Esterkmans (or *Sterckmans*), see Beurré Sterckmans.
Doyenné Gris, see Red Doyenné.
English Bergamot, see Autumn Bergamot.
Grand Monarque, see Catillac.
Hazel, see Hessele.
His, see Baronne de Mello.
Huyshe's Bergamot, see Huyshe's Prince of Wales.
Louise d'Avranches, see Louise Bonne of Jersey.
Louise d'Orleans, see Urbaniste.
Madeleine, see Citron des Carmes.
Monarch, see Knight's Monarch.
Pound Pear, see Catillac.
Roi de Wurtemberg, see Glou Morceau.
St. Jean Baptiste, see Comte de Flandre.
Soldat Esperen, see Soldat Laboureur.
Summer Doyenné, see Doyenné d'Été.
Suprême, see Windsor.
Teton de Venus, see Bellissime d'Hiver.
Trout Pear, see Forelle.
Winter Franc Réal, see Franc Réal d'Hiver.
York Bergamot, see Autumn Bergamot.

SELECT LISTS.

In the following lists selections of Pears have been made for various purposes, to guide those who wish to grow useful varieties. It is impossible to make a selection that would be equally good in all districts and soils—experience with this fruit is more varied than with any other—but an effort has been made to include only those that are satisfactory under the greatest range of conditions.

Sixty Useful Pears.

(The varieties are arranged in dozens, which are placed approximately in the order of merit as regards quality and general experience of their reliability, but each dozen constitutes a selection in itself and adapted for different requirements.)

(1)			
Beurré Diel.	Oct.-Nov.	Marie Louise.	Oct.-Nov.
Beurré Superfin.	Sept.-Oct.	Seckle.	Oct.
Doyenné d'Été.	July.	Williams' Bon Chrétien.	Aug.-Sept.
Doyenné du Comice.	Nov.-Dec.		
Easter Beurré.	Jan.-Mar.	(2)	
Forelle.	Nov.-Feb.	Beurré Rance.	Jan.-Mar.
Gansel's Bergamot.	Oct.-Nov.	Brown Beurré.	Oct.
Glou Morceau.	Nov.-Jan.	Conference.	Nov.
Louise Bonne of Jersey.	Oct.	Dr. Jules Guyot.	Sept.

Emile d'Heyst.	Oct.-Nov.	Beurré d'Anjou.	Oct.-Dec.
Joséphine de Malines.	Dec.-Mar.	Beurré de Jonghe.	Dec.-Feb.
Madame Treyve.	Sept.	Beurré Giffard.	Aug.
Maréchal de Cour.	Oct.-Nov.	Colmar.	Nov.-Feb.
Pitmaston Duchess.	Oct.-Nov.	Fondante d'Automne.	
Souvenir du Congrès.	Aug.-Sept.		Sept.-Oct.
Thompson's.	Nov.	Jersey Gratioli.	Oct.
Winter Nelis.	Dec.-Feb.	March Bergamot.	Feb.-Mar.
(3)		Nouveau Poiteau.	Nov.
Beurré d'Amanlis.	Sept.	Passe Colmar.	Nov.-Dec.
Beurré Hardy.	Oct.	Red Doyenné.	Oct.-Nov.
Citron des Carmes.	July-Aug.	(5)	
Clapp's Favourite.	Aug.	Beurré Bosc.	Oct.-Nov.
Comte de Lamy.	Oct.	Beurré Clairgeau.	Nov.
Durondeau.	Oct.-Nov.	Beurré Mortillet.	Sept.-Oct.
Fertility.	Sept.-Oct.	Duchesse de Bordeaux.	
Jargonelle.	Aug.		Dec.-Feb.
Nec Plus Meuris.	Jan.-Mar.	Flemish Beauty.	Sept.-Oct.
Nouvelle Fulvie.	Nov.-Feb.	General Todleben.	Dec.-Feb.
Olivier de Serres.	Feb.-Mar.	Marguerite Marillat.	Sept.
Triomphe de Vienne.	Sept.	Marie Benoist.	Nov.-Jan.
(4)		Marie Louise d'Uccle.	Oct.
Autumn Nelis.	Oct.	Passe Crasanne.	Jan.-Mar.
Bergamotte Esperen.	Jan.-Apr.	Van Mons Léon Leclerc.	Nov.
		Zéphirin Grégoire.	Dec.-Jan.

High-quality Pears.

(Arranged in dozens, placed approximately in the order of merit, the varieties being selected with regard to their special flavours and general good quality.)

THIRTY-SIX LARGE PEARS.

(1)		Fondante de Thiriott.	
Beurré Diel.	Oct.-Nov.		Nov.-Dec.
Beurré Rance.	Jan.-Mar.	Jargonelle.	Aug.
Beurré Superfin.	Sept.-Oct.	Jersey Gratioli.	Oct.
Brown Beurré.	Oct.	Joséphine de Malines.	
Doyenné du Comice.	Nov.-Dec.		Dec.-Mar.
Easter Beurré.	Jan.-Mar.	Marie Benoist.	Nov.-Jan.
Glou Morceau.	Nov.-Jan.	Souvenir du Congrès.	
Madame Treyve.	Sept.		Aug.-Sept.
Maréchal de Cour.	Oct.-Nov.	(3)	
Marie Louise.	Oct.-Nov.	Beurré de Jonghe.	Dec.-Feb.
Pitmaston Duchess.	Oct.-Nov.	Beurré Fouqueray.	
Williams' Bon Chrétien.	Aug.-Sept.	Beurré Lefebvre.	Oct.
		British Queen.	Oct.
(2)		Chaumontel.	Nov.-Mar.
Beurré Hardy.	Oct.	Comte de Flandre.	Nov.-Dec.
Bishop's Thumb.	Oct.-Nov.	Délices d'Hardenpoint.	Nov.
Durondeau.	Oct.-Nov.	Désiré Cornélis.	Aug.-Sept.
Emile d'Heyst.	Oct.-Nov.	Duc de Nemours.	Dec.
Flemish Beauty.	Sept.-Oct.	Magnate.	Oct.-Nov.
Fondante d'Automne.		Nouveau Poiteau.	Nov.
	Sept.-Oct.	Princess.	Oct.-Dec.

THIRTY-SIX SMALL OR MEDIUM-SIZED PEARS OF HIGH QUALITY.

(1)		Hacon's Incomparable.	
Autumn Bergamot.	Oct.		Nov.-Dec.
Belle Julie.	Oct.	Hessle.	Oct.
Citron des Carmes.	July-Aug.	March Bergamot.	Feb.-Mar.
Forelle.	Nov.-Feb.	Nouvelle Fulvie.	Nov.-Feb.
Gansel's Bergamot.	Oct.-Nov.	Passe Colmar.	Nov.-Dec.
Louise Bonne of Jersey.	Oct.	Suffolk Thorn.	Oct.
Nec Plus Meuris.	Jan.-Mar.	Urbaniste.	Oct.
Olivier de Serres.	Feb.-Mar.	(3)	
Seckle.	Oct.	Bergamotte de Millepieds.	Oct.
Thompson's.	Nov.	Catinka.	Dec.
Winter Nelis.	Dec.-Feb.	Colmar d'Été.	Sept.
Zéphirin Grégoire.	Dec.-Jan.	Dana's Hovey.	Nov.-Jan.
(2)		De Maraise.	Oct.
Althorp Crasanne.	Oct.-Dec.	Doyenné Defays.	Oct.-Nov.
Bergamotte Esperen.	Jan.-Apr.	Fondante de Cuerne.	Sept.
Beurré Giffard.	Aug.	Jean de Witte.	Jan.-Mar.
Doyenné d'Alençon.	Dec.-Feb.	Knight's Monarch.	Dec.-Jan.
Duchesse de Bordeaux.	Dec.-Feb.	Red Doyenné.	Oct.-Nov.
		Rousselet de Rheims.	Sept.
		Vineuse.	Sept.-Oct.

Thirty-six Handsome Pears for Exhibition and Use.

Beurré Alexandre Lucas.	Dec.	Flemish Beauty.	Sept.-Oct.
Beurré Baltet Père.	Nov.	Fondante de Thiriott.	
Beurré Bosc.	Oct.-Nov.		Nov.-Dec.
Beurré Clairegeau.	Nov.	General Todleben.	Dec.-Feb.
Beurré Diel.	Oct.-Nov.	Glou Morceau.	Nov.-Jan.
Beurré Fouqueray.	Oct.	Grégoire Bordillon.	Sept.
Beurré Hardy.	Oct.	King Edwards.	Sept.-Nov.
Beurré Mortillet.	Sept.-Oct.	Louise Bonne of Jersey.	Oct.
Beurré Superfin.	Sept.-Oct.	Magnate.	Oct.-Nov.
Clapp's Favourite.	Aug.	Maréchal de Cour.	Oct.-Nov.
Conference.	Nov.	Marguerite Marillat.	Sept.
Dr. Jules Guyot.	Sept.	Marie Benoist.	Nov.-Jan.
Doyenné Boussoch.	Oct.-Nov.	Marie Louise.	Oct.-Nov.
Doyenné du Comice.	Nov.-Dec.	Marie Louise D'Uccle.	Oct.
Duchesse d'Angoulême.		Pitmaston Duchess.	Oct.-Nov.
	Oct.-Nov.	Princess.	Oct.-Dec.
Duchesse de Bordeaux.		Souvenir du Congrès.	
	Dec.-Feb.		Aug.-Sept.
Durondeau.	Oct.-Nov.	Triomphe de Vienne.	Sept.
Emile d'Heyst.	Oct.-Nov.	Van Mons Léon Leclerc.	Nov.

Popular Pears.

(The following list of sixty varieties of Pears will give a good idea of the relative popularity of different varieties for exhibition purposes. It is condensed from the useful Audit of the Royal Horticultural Society's Show at the Crystal Palace in 1900, prepared by the editor of the *Gardeners' Magazine*. The numbers in brackets following the names indicate the number of times the variety was represented in the exhibition.)

Pitmaston Duchess (82).	Emile d'Heyst (11).
Doyenné du Comice (61).	Princess (11).
Louise Bonne of Jersey (59).	Catillac (10).
Marie Louise (45).	Comte de Lamy (10).
Souvenir du Congrès (43).	Seckle (10).
Durondeau (34).	Gansel's Bergamot (9).
Beurré Diel (33).	Beurré Fouqueray (8).
Beurré Superfin (33).	Jersey Gratioli (8).
Williams' Bon Chrétien (33).	Thompson's (8).
Doyenné Boussoch (28).	Beurré Alexandre Lucas (7).
Duchesse d'Angoulême (27).	Beurré Rance (7).
Beurré Hardy (25).	Nouvelle Fulvie (7).
Bonne d'Ezée (Brockworth Park) (24).	Beurré Baltet Père (6).
Triomphe de Vienne (21).	Beurré Mortillet (6).
Conference (20).	Beurré Sterckmans (6).
Fondante d'Automne (20).	Fondante de Thiriott (6).
Glou Morceau (20).	Bergamotte Esperen (5).
Marguerite Marillat (20).	Magnate (5).
Marie Benoist (20).	Triomphe de Jodoigne (5).
Marie Louise D'Uccle (20).	Vicar of Winkfield (5).
General Todleben (18).	Van Mons Léon Leclerc (5).
Beurré Bosc (17).	Bellissime d'Hiver (4).
Madame Treyve (17).	Chaumontel (4).
Beurré d'Amanlis (14).	Fertility (4).
Easter Beurré (13).	Flemish Beauty (4).
Joséphine du Malines (13).	Le Lectier (4).
Winter Nelis (13).	Uvedale's St. Germain (4).
Beurré Bachelier (12).	Brown Beurré (3).
Beurré d'Anjou (12).	Directeur Hardy (3).
Beurré Clairegeau (11).	Duchesse de Bordeaux (3).

Pears for Large Pyramid or Orchard Standard Trees.

Aston Town.	Emile d'Heyst.
Beacon.	Eyewood.
Belle Julie.	Fertility.
Bellissime d'Hiver.	Hessle.
Beurré Bosc.	Jargonelle.
Beurré Capiaumont.	Joséphine de Malines.
Beurré Clairegeau.	Louise Bonne of Jersey.
Beurré Hardy.	Marie Louise.
Clapp's Favourite.	Princess.
Doyenné Boussoch.	Vicar of Winkfield.
Doyenné d'Été.	Williams' Bon Chrétien.
Durondeau.	

Prolific Pears for Market or General Use. Pyramids on Quince (or double-grafted).

Althorp Crasanne.	Oct.-Dec.	Beurré Bachelier.	Dec.
Autumn Nelis.	Oct.	Beurré Bosc.	Oct.-Nov.
Bergamotte Esperen.	Jan.-Apr.	Beurré Capiaumont.	Oct.

Beurré Clairegeau.	Nov.	Fondante de Thiriott.	
Beurré d'Amanlis.	Sept.		Nov.-Dec.
Beurré de l'Assomption.	Aug.	Glou Morceau.	Nov.-Jan.
Beurré Hardy.	Oct.	Hessle.	Oct.
Beurré Superfin.	Sept.-Oct.	Louise Bonne of Jersey.	Oct.
Bishop's Thumb.	Oct.-Nov.	Madame Treyve.	Sept.
Citron des Carmes.	July-Aug.	Marie Louise.	Oct.-Nov.
Conference.	Nov.	Marie Louise d'Uccle.	Oct.
Dr. Jules Guyot.	Sept.	Napoléon.	Nov.-Dec.
Doyenné du Comice.	Nov.-Dec.	Pitmaston Duchess.	Oct.-Nov.
Durondeau.	Oct.-Nov.	Seckle.	Oct.
Easter Beurré.	Jan.-Mar.	Vicar of Winkfield.	Nov.-Jan.
Emile d'Heyst.	Oct.-Nov.	Williams' Bon Chrétien.	
Fondante d'Automne.			Aug.-Sept.
	Sept.-Oct.	Winter Nelis.	Dec.-Feb.

Pears for Training to Walls.

EIGHTEEN FOR SOUTHERLY ASPECTS.

Bergamotte Esperen.	Jan.-Apr.	Gansel's Bergamot.	Oct.-Nov.
Beurré d'Anjou.	Oct.-Dec.	Glou Morceau.	Nov.-Jan.
Beurré de Jonghe.	Dec.-Feb.	Jargonelle.	Aug.
Beurré Rance.	Jan.-Mar.	Knight's Monarch.	Dec.-Jan.
Beurré Sterckmans.	Dec.-Jan.	Magnate.	Oct.-Nov.
Beurré Superfin.	Sept.-Oct.	Marie Benoist.	Nov.-Jan.
Brown Beurré.	Oct.	Marie Louise.	Oct.-Nov.
Chaumontel.	Nov.-Mar.	Olivier de Serres.	Feb.-Mar.
Doyenné du Comice.	Nov.-Dec.	Pitmaston Duchess.	Oct.-Nov.

EIGHTEEN FOR EASTERLY AND WESTERLY ASPECTS.

Bergamotte Esperen.	Jan.-Apr.	Joséphine de Malines.	
Beurré Giffard.	Aug.		Dec.-Mar.
Beurré Superfin.	Sept.-Oct.	Louise Bonne of Jersey.	Oct.
Clapp's Favourite.	Aug.	Maréchal de Cour.	Oct.-Nov.
Doyenné du Comice.	Nov.-Dec.	Marie Louise.	Oct.-Nov.
Durondeau.	Oct.-Nov.	Nec Plus Meuris.	Jan.-Mar.
Emile d'Heyst.	Oct.-Nov.	Passe Colmar.	Nov.-Dec.
Fondante d'Automne.		Thompson's.	Nov.
	Sept.-Oct.	Triomphe de Vienne.	Sept.
Glou Morceau.	Nov.-Jan.	Winter Nelis.	Dec.-Feb.

Pears for Small Gardens.

SIX USEFUL VARIETIES.

Belle Julie.	Oct.	Joséphine de Malines.	
Doyenné du Comice.	Nov.-Dec.		Dec.-Mar.
Fertility.	Sept.-Oct.	Williams' Bon Chrétien.	
Louise Bonne of Jersey.	Oct.		Aug.-Sept.

THREE FOR WALLS.

Doyenné du Comice.	Nov.-Dec.	Joséphine de Malines.	
Jargonelle.	Aug.		Dec.-Mar.

Culinary (Stewing or Baking) Pears.

Bellissime d'Hiver.	Nov.-Apr.	Gilles-6-Gilles.	Nov.-Feb.
Black Worcester.	Nov.-Feb.	Léon Leclerc de Laval.	
Catillac.	Dec.-Apr.		Jan.-May.
Flemish Bon Chrétien.		Uvedale's St. Germain.	
	Nov.-Mar.		Jan.-April.
Franc Réal d'Hiver.	Jan.-Mar.	Verulam.	Jan.-Mar.

THE BEST THREE VARIETIES.

Bellissime d'Hiver.	November-April.
Catillac.	December-April.
Verulam.	January-March.

THE BEST VARIETY.

Catillac.	December-April.
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Twelve Hardy Pears for Northern Districts.

Beurré d'Amanlis.	Jargonelle.
Beurré de Capiaumont.	Louise Bonne of Jersey.
Comte de Lamy.	Red Doyenné.
Crawford.	Swan's Egg.
Doyenné d'Été.	Thompson's.
Hessle.	Williams' Bon Chrétien.

Pears for Scotland.

(The following list is condensed from the returns obtained at the Royal Caledonian Horticultural Society's Pear Congress at Edinburgh a few years ago, the numbers following the names indicating by how many cultivators the variety was recommended as satisfactory. The months indicate the times when the varieties are fit for use in the north, which differ slightly from the maturing periods in more southern districts. The majority of the best Pears in the northern counties of England and in Scotland cannot be grown with success except as trained trees against suitable walls.)

DESSERT PEARS.

Beurré d'Amanlis (28).	Oct.	Louise Bonne of Jersey (32).	Nov.
Beurré Rance (24).	May.		Dec.
Easter Beurré (40).	Apr.	Marie Louise (55).	
Glou Morceau (27).	Mar.	Williams' Bon Chrétien (44).	
Hacon's Incomparable (22).	Feb.		Sept.
Jargonelle (56).	Aug.	Winter Nelis (20).	Jan.

DESSERT PEARS FOR BUSHES.

Beurré Capiaumont (10).	Jargonelle (27).
Beurré d'Amanlis (28).	Louise Bonne of Jersey (36).
Beurré d'Arenberg (17).	Marie Louise (21).
Beurré Diel (19).	Muirfowl's Egg (22).
Easter Beurré (16).	Swan's Egg (12).
Hacon's Incomparable (22).	Williams' Bon Chrétien (35).

PEARS FOR ORCHARDS.

Autumn Bergamot (12).	Louise Bonne of Jersey (13).
Crawford (17).	Muirfowl's Egg (27).
Hessle (43).	Swan's Egg (13).

STEWING PEARS.

Catillac (45).
Uvedale's St. Germain (19).
Verulam (16).

Perry Pears.

(The best varieties of Pear grown for the production of Perry in Herefordshire are the following, of which Mr. C. W. Radclyffe Cooke, M.P., gives full descriptions in his work on Cider and Perry.)

EARLY VARIETIES.

Barland.	Taynton Squash.
Moorcroft.	Thorn Pear.
Red Pear.	

MIDSUMMER VARIETIES.

Langland.	Yellow and Black Huffcap.
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LATE VARIETIES.

Blakeney Red.	Pine Pear.
Butt Pear.	Rock Pear.
Oldfield.	

Pears that should be Double-grafted on the Quince.

Beacon.	Forelle.
Belle Julie.	Gansel's Bergamot.
Bellissime d'Hiver.	Huyshe's Prince Consort.
Beurré Berckmans.	Jargonelle.
Beurré Bosc.	Jean de Witte.
Beurré Clairgeau.	Joséphine de Malines.
Beurré de Jonghe.	King Edward's.
Beurré Langelier.	Knight's Monarch.
Beurré Mortillet.	Marie Guisse.
Bishop's Thumb.	Marie Louise.
British Queen.	Nec Plus Meuris.
Brown Beurré.	Passe Crasanne.
Citron des Carmes.	Saint Germain.
Clapp's Favourite.	Seckle.
Comte de Flandre.	Souvenir du Congrès.
Comte de Lamy.	Suffolk Thorn.
Crasanne.	Thompson's.
Dana's Hovey.	Triomphe de Vienne.
Doyenné d'Été.	Urbaniste.
Duchesse de Bordeaux.	Uvedale's St. Germain.
Eyewood.	Van Mons Léon Leclerc.
Flemish Beauty.	Zéphirin Grégoire.

[R. L. C.]

CHAPTER VI.

PLUMS AND DAMSONS.

ORIGIN—SOIL AND SITUATION—PLANTING—PRUNING AND TRAINING—ROOT-LIFTING—GATHERING AND PRESERVING THE FRUIT—EVAPORATING—PROPAGATION—SELECT LIST—BULLACES—JAPANESE PLUMS.

According to the highest botanical authority,¹ the Plum, the Damson, the Sloe, and the Bullace are all forms of *Prunus communis* (fig. 947), which is common in hedges, thickets, and open woods in Europe and in Russian and Central Asia. The Bullace has also been recognized as a distinct species, under the name of *P. insititia*; the Damson and numerous varieties of Plums grown in gardens, although growing into thornless trees, are believed to be varieties of *P. communis*, produced by long cultivation; they will occasionally sow themselves, and may be found apparently wild in the neighbourhood of gardens and orchards, retaining their arborescent character. Some botanists, however, distinguish them as a species under the name of *P. domestica*.

"It is very doubtful if *P. domestica* is indigenous in Europe. In the south, where it is given, it grows chiefly in hedgerows near dwellings, with all the appearance of a tree scarcely naturalized, and maintained here and there by means of seeds brought from plantations. . . . In spite of the abundance of Plums cultivated formerly by the Romans, no kind is found represented in the frescoes at Pompeii. Neither has *P. domestica* been found among the remains of the lake-dwellings of Italy, Switzerland, and Savoy, where, however, stones of the Bullace and the Sloe have been discovered. . . . The Plums cultivated at Damascus (whence Damascenes or Damsons) have a reputation which dates from the days of Pliny. . . . The Chinese have cultivated different kinds of Plums from time immemorial, but they are probably of a different species from ours." (De Candolle, *Origin of Cultivated Plants*.)

There are several hundred named varieties of Plums in cultivation in the British Isles. Some of these are of recent origin, but with regard to many of them nothing appears to be known beyond that we are indebted to France for their introduction. Parkinson (1628) enumerated sixty named varieties, "all which sorts are to be had of my very good friend,

¹ Bentham & Hooker's *British Flora*.

Master John Tradescante, who hath wonderfully laboured to obtain all the rarest fruits he can hear of in any place of Christendome, Turkey, yea of the whole world”.

John Gerarde wrote three centuries ago: “To write of Plums particularly would require a peculiar volume. . . . Every clymate hath his owne fruite, far different from that of other countries; my selfe have threescore sorts in my garden, and all strange and rare; there be in other places many more common, and yet

yearly commeth to our hands others not before knowne.”

As in the case of Apples and Pears, Plums raised from seeds generally show considerable variety, and as they have been favourite fruits in European gardens for many centuries, their characters have been greatly modified by cultivation and selection. Some varieties are said to come tolerably true from seeds, especially the Green Gage, Prune, Myrobalan, and Damson.

In the United States of America several

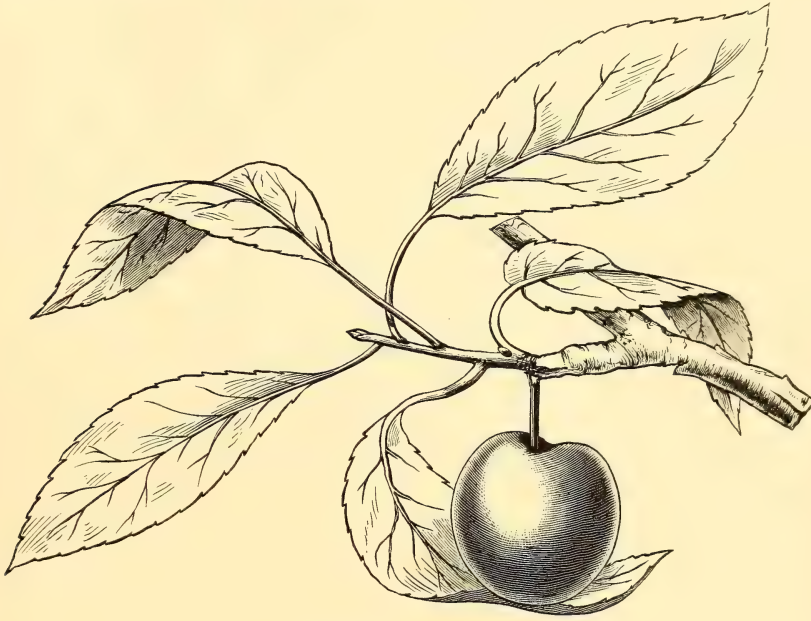


Fig. 947.—*Prunus communis*.

native species of *Prunus* have been brought into gardens, and by selection and crossing have yielded improved useful fruits (fig. 948). “In this way, about a hundred choice forms of the native Plum of the North-west (*Prunus Americana*) have been gathered and sorted and given names; and they are so much more hardy and reliable than the European type of Plum, that they will probably form the chief foundation from which the future orchard Plums of the northern prairie states will spring. They are already grown to an important commercial extent” (Bailey). Other American species of *Prunus* from which useful garden Plums have been evolved are *P. angustifolia* (Chickasaw Plums) and *P. hortulana* (Wild Goose, Miner, Wayland, &c., Plums). A form of the last-named has been successfully hybridized with a Peach.

The European Plums are largely cultivated in some parts of the United States, and some of our most valuable varieties were raised there.

Among them the Jefferson holds first rank; Denniston's Superb, Huling's Superb, Smith's Orleans, Autumn Gage, and several others were rated first-rate by that most successful English raiser of new Plums, the late Thomas Rivers.

The production of dried Prunes is an important industry in many parts of Europe and in several of the United States, particularly California. The principal varieties cultivated for this purpose are: in France, the “Prunier d'ente”; in Germany, the Quetschen; and in California, the “Prune d'Agen” (fig. 949). The fruits of these have thicker skins than the ordinary garden Plums; the pulp is greenish and rather austere unless fully ripe, and it does not cling to the stone. The process of curing is a somewhat elaborate one. A full account of it is given in the *Kew Bulletin* for 1890.

Soil and Situation.—The Plum will grow freely in any good loamy soil, neither too dry nor having a wet subsoil. In strong soils the trees

make vigorous shoots when the ground begins to get warm after midsummer. The roots develop nearer the surface than those of the Apple and Pear, and therefore they do not naturally require the soil to be so deep. Vicissitudes of moisture and dryness are very prejudicial to stone fruits, frequently causing them to gum; the cause of this should be

avoided; therefore the ground ought to be trenched rather deeply, for the amount of moisture in a deeply loosened soil is far more uniform than in shallow, untrenched ground. The subsoil should be well drained.

The choice varieties should be accorded the protection of a wall; one having an eastern or western aspect is generally reserved for Plums.

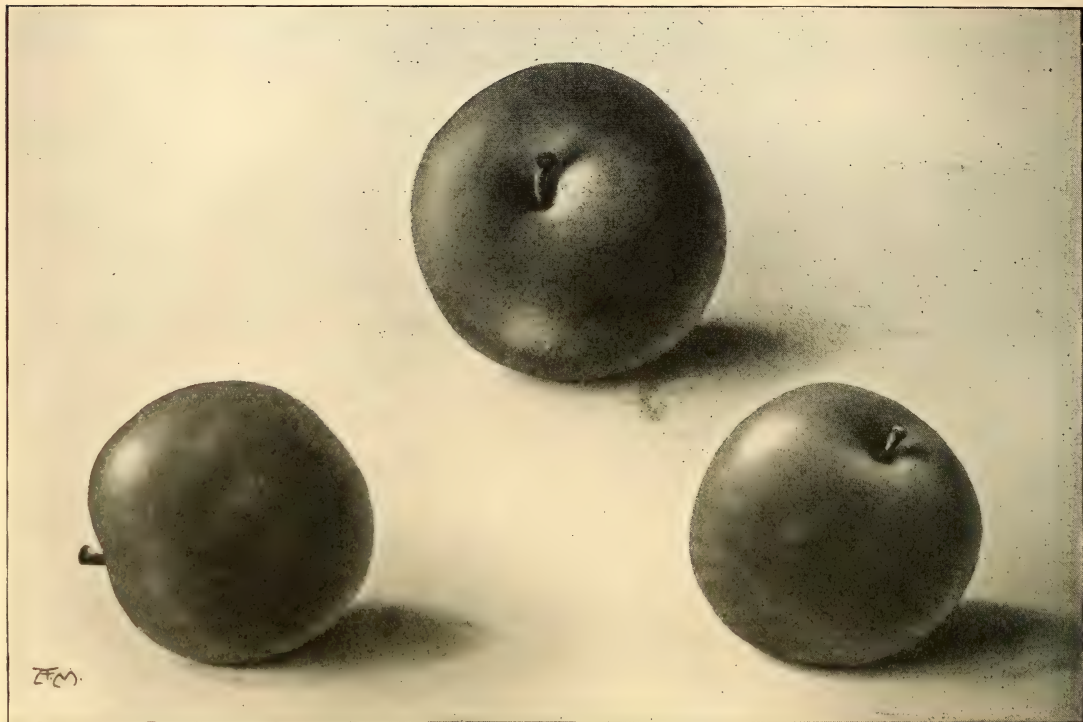


Fig. 948.—American Hybrid Plums. ($\frac{2}{3}$ nat. size.)

The culinary and more hardy kinds succeed either as standards or bushes in the open.

Planting.—The ground having been prepared, as already directed for the Apple and Pear, the distance between the trees requires to be determined. If they are to be planted in the open, the distance for standards, half-standards, and dwarfs may be from 20 to 25 feet between the rows, and about 20 feet apart in the rows; or, if planted in the quincunx manner, which is the best, the distance between the rows being 24 feet, that of the trees in the row will be about 20 feet. If the rows are 20 feet apart, then the trees in the row will be about 17 feet apart. If espaliers are afforded for Plums in a quarter, they may range about 12 feet apart from row to row if the extent of ground is limited, but if not, 15 feet should be allowed; in either case the distance between the trees in the row ought not to be less than 15 feet. Small pyramids

and bushes may be planted from 6 to 9 feet apart. Against walls the distance may be from 15 to 20 feet for trained trees, and 2 feet apart for single-stemmed cordons.

The trees should be planted as recommended for the Apple and Pear. Mulching, in case of dry weather, is advantageous; for, if the root fail to supply enough sap to the tree, gumming is apt to ensue. The supply of sap cannot be uniform unless the moisture of the soil about the roots is steadily maintained, and this is done by mulching.

Pruning and Training.—For standard trees, where under-cropping is intended, the height of the stem should not be less than 6 feet. By depressing early the strongest and elevating the weakest shoots on young standards, the equilibrium of the head is maintained; or the points of the strongest shoots must be pinched when about a foot long. Towards September

the shoots should be so disposed as to have an equal divergence. After this, it will only be necessary to check all over-luxuriant shoots, and to keep the head of the tree clear of branches that cross and would rub against others. If the shoots generally are seen to be growing very luxuriantly, it would be well to pinch their tops about midsummer; otherwise, when very long shoots are allowed to be made, nearly their whole extent may be naked in the course of a year or two.

For trees against walls, unless the latter are very low, the fan mode is the best; for, being a stone fruit, the branches of the Plum are more apt to die off than those of the Apple and Pear, and, that being the case, fan-training admits of vacancies being filled up by a redistribution of the branches.

The foundation of dwarf trees, trained either as pyramids or bushes, should be prepared in the same manner as recommended for standards, only with this difference in the case of pyramids, a central shoot must be preserved to form stems with and extend the trees to the desired height in a vertical direction. In regard to bushes, the central shoot should be dispensed with, the aim in this case being to form a bush with a centre somewhat open, and with the branches widely disposed and spreading, rather than of a compact form as in a pyramid. This admits of an abundance of sunlight reaching to all parts of the tree, hence the superiority of the bush over the pyramidal trained trees.

These two forms of tree should always be summer pruned, *i.e.* to stop all young growths emanating from spurs and last season's wood, to five buds, to form spurs with in the latter case, and to induce the formation of fruit-buds in the former. This is best done about the middle of August. If done earlier than this, the buds on the shortened back pieces of wood are apt to break and make secondary growths. The young shoots on the extremities of the main branches should be left intact until winter-

time, when they may be shortened as much as may be necessary.

Cordons are formed by planting one-year or "maiden" trees. Cut back the stem to where there is a prominent bud facing either to the



Fig. 949.—Californian Prune or Prune d'Agen
(*Prunus communis*, var.).

right or left, and train up the resulting shoot the following summer. Stop all other growths produced below this shoot to five buds, to form spurs. If all goes well, the leading shoot will make from 4 feet to 6 feet of growth by the autumn. This must in turn be shortened back from 2 to 4 feet, and another leader trained up the following summer, stopping all growths below to form spurs as before, and continuing in this manner until the tree reaches to the top of the wall. In the autumn of the third season after planting lift and transplant the tree to throw it into a bearing condition, and summer prune in mid-August every season afterwards.

The shoots of the Plum do not require to be shortened at the winter pruning if their extremities are well ripened, except where branches are required. Numerous shoots will push, more especially from the upper sides of the branches. These shoots must be pinched below the sixth leaf, when they have made

as many. They should be shortened at the winter pruning, and, on the portions left, fruit-



Fig. 950.—Fruit-spurs of Plum.

buds will form or shoots push (fig. 950). In the latter case pinching must be resorted to.

When spurs grow too far from the wall they must be cut back; but those on the lower branches should be allowed to extend a little more than those on the upper side, in order that as much, or rather more, foliage may be in connection with the lower branches as there is on the upper; for, otherwise, most of the sap would be drawn to the latter, and the lower branches would ultimately perish. In proportion to the equal distribution of the sap, so will be the health, duration, and fruitfulness of the tree; and the sap can only be equally distributed by each branch being furnished with an equal amount of foliage. Where any shoots give indications of excessive vigour, they should be early kept in check. The young summer shoots in the upper part of the tree should receive their summer pruning before those in the lower part. Frequently the shoots in the central part of fan-trained trees are inclined to become excessively vigorous. As they cannot well be much inclined from their upright position without crowding those on the

sides, their vigour may be considerably repressed by pinching, or nicely cutting out the growing point with a sharp penknife. This will cause some delay in the progress of the shoot, and consequently in the production of leaves; those already formed will, however, become larger than if the above operation had not been performed.

When the horizontal mode of training is adopted, whether on walls or espaliers, the first course should be 1 foot from the ground, and the others 9 inches apart. Care, however, must be taken to originate the branches 4 or 5 inches below the horizontal line along which they are intended to be trained. If this be done, the branches will not be so liable to die as when they were taken at right angles from the upright stem, which in training stone-fruit-trees should never be the case.

Root-lifting.—Plums, when planted in rich soil, are likely to grow over-luxuriantly, and to bear little or no fruit. To remedy this, they should be lifted and replanted about the end of October. This checks the rank growth and induces the formation of fruit-buds. Trees when once brought into bearing condition rarely give further trouble; but, should they still be unfruitful, lift them again the following autumn and mix some lime rubble with the soil when replanting.

The roots of the Plum run near the surface (see fig. 951), and on this account the ground must either be dug every year or not at all. Trees

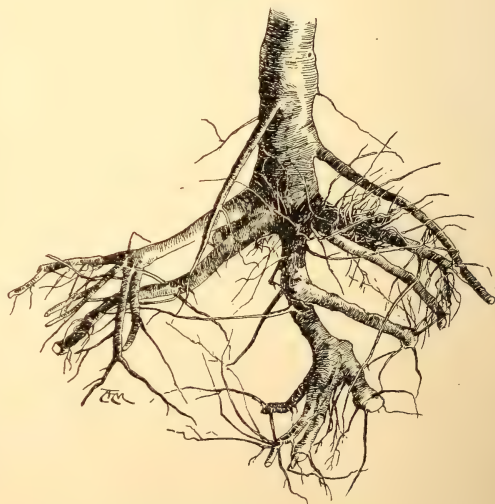


Fig. 951.—Root system of a well-managed Plum.

have been known to thrive very well where the ground was regularly dug for vegetable crops; but on its being left undug for two years, the

roots made rapid progress towards the surface, and on again digging the soil for cropping, the trees suffered from the loss of the young roots which had been formed.

Suckers that spring from the roots of the Plum should be removed. They are more apt to push from trees that are sickly than from healthy ones. The under side of the foliage is sometimes entirely covered with aphides, and when this is the case of course the tree cannot long remain healthy, however well it may be circumstanced in other respects. Every possible means should therefore be adopted to keep the foliage clean; and at the same time, in order that it may be naturally healthy, the roots must be duly supplied with moisture. Established trees in full bearing should each season be dressed either with farmyard or artificial manure, otherwise they are apt to become exhausted and bear but indifferent crops of fruit.

Gathering and Preserving the Fruit.—Plums should be allowed to remain on the tree as long as possible. Choice fruit ought to be gathered by severing the stalk with a pair of grape scissors and without disturbing the bloom, especially if the fruit is of a variety intended to be kept for some time. Such kinds as Coe's Golden Drop, Ickworth Impératrice, Reine Claude Violette, and others, may be kept for months fit for dessert if gathered in dry weather, wrapped in paper, and laid in a dry airy place.

Evaporating Plums.—For this purpose the fruit ought to be quite ripe; if shrivelled a little, so much the better; they must be graded according to size and condition. Place the trays containing the fruit first over the furnace in the upper flue of a Universal American Fruit Evaporator (Rider's patent), heated to a temperature, at this place, of 220° to 240°; leave them until they are about to burst, then take them out and cool them as quickly as possible. Then place them in the evaporator at the rear end of the upper flue until they begin to shrink, when they should be taken out again and allowed to cool, before replacing them again in the front of the upper flue to be finished. They must be stirred or turned, to prevent their sticking to the frame. It is not advisable to dry them until they get hard; when the stone in the fruit moves about readily, they are about fit. With a temperature of 220° to 240° medium-sized fruits will require about eleven hours to evaporate.

Propagation.—Some kinds of Plums are pro-

pagated by seed, others occasionally by suckers; but the usual mode of propagating the cultivated varieties is by budding and grafting. Propagation by sowing the stones is employed for raising stocks on which to graft Plums, Peaches, Nectarines, and Apricots. The Mussel, White Pear Plum, and St. Julien are the sorts chiefly employed for stocks. For standards the Mussel answers well.

The stones, as soon as taken from the fruit, should be sown in a bed of rich sandy soil an inch apart, in drills 2 inches deep, and 9 inches or 1 foot asunder. Some recommend the stones to be dried a little in the sun, packed in dry sand till November, and then sown. The French stratify the stones till spring, and then plant them out in rows. By either of these modes the seedlings will be fit for transplanting into nursery lines in autumn. In doing this the unripe extremities of the leading and side shoots should be cut off; the tap-root may also be shortened. Twelve months after this they ought to be cut down to two buds above the surface. In the following spring both buds will likely push, but only one should be allowed to grow for a standard stem, or for being budded high or low as may be desired.

Budding and grafting are the modes usually adopted for propagating the varieties. Strong-growing sorts intended for standards may be grafted or budded near the ground, and the stem formed from the scion. In the case of weaker-growing kinds, such as the Mirabelle, it is better to allow the stock to grow up, and bud or graft it standard high. Some prefer budded plants, others those which are grafted; but, if properly worked, good trees can be obtained by either mode. Nurserymen usually have less ground-work on hand at the budding than at the grafting season, and therefore find it convenient to propagate at the former period. Besides, if buds should not take, the stocks can be grafted in the following spring. In order that the graft may form a sound union, attention to a few particulars is necessary. The scions should be taken off early in the season, say in January, or at least before the buds begin to push. At the same time the stock should be headed down near to the place where the scion is to be put on. If either the scion or the stock, or both, are too far advanced when they are cut, success is rendered uncertain. Even if the graft should take, gum or canker is likely to follow. The grafts of Plums are more apt to fail than those of Apples and Pears; yet, when the stocks are early headed

down and the scions taken off in good time, as directed, they will generally succeed. It is a good plan to earth up the grafts above the clay,

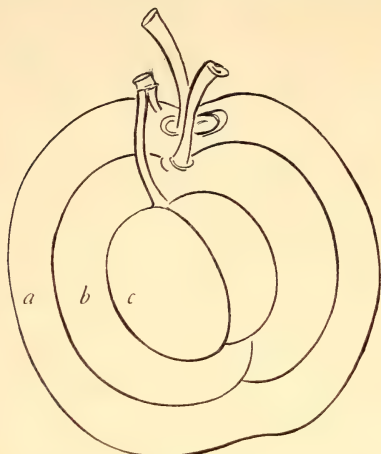


Fig. 952.—Sizes of Plums.

a, Washington, large. b, Coe's Late Red, medium. c, Coe's Mirabelle, small.

where this can be done, as the soil helps to keep the clay from drying.

In budding, care must be taken that wood and not blossom buds are inserted; and in grafting, it is necessary to see that there are wood buds on the scion. Occasionally it may be desirable to propagate a particular variety, the shoots of which have scarcely any wood buds, except their terminal ones; and when such shoots must be employed for scions, the buds at the extremities should not be cut away; they must form the terminal bud of the scion.

Insects, &c. (Plum).—See chapter on this subject. *Bark Enemies.*—Apple Mussel Scale, Woëberian Tortrix. *Fruit and Seed Enemies.*—Birds, Plum Sawfly, Red Grub of Plum, Wasps. *Leaf Enemies.*—Plum Aphides, Red Spider, Slug-worms, Small Ermine Moth, Winter Moth. *Stem Borers.*—Stem-boring Weevils, Wood Leopard Moth.

SELECT LIST OF VARIETIES OF PLUMS.

Angelina Burdett.—Dessert. August–September. A Plum of the finest quality. Fruit medium, round, dark-purple, marked with a suture; skin thick, mottled with brown; flesh yellowish, juicy, and richly flavoured. A good grower and bearer either on a wall or as a bush.

Archduke.—Culinary. October. Fruit large, oval, purple. An immense cropper and a good grower on walls or fences, or as a bush. Raised by Mr. Rivers.

Autumn Compôte.—Culinary. September. Fruit handsome, very large, bright-red; skin thin; flesh yellow, tender, and juicy. A hardy and productive variety, best grown on a wall, as the skin is apt to split on trees in the open in a wet season.

Belgian Purple.—Culinary and dessert. Mid-August. Fruit medium to large, roundish, violet-purple, with a

copious bloom; flesh greenish, juicy, sweet and rich when thoroughly ripe. The tree has a hardy vigorous constitution, and is a great bearer. A first-rate market variety.

Belle de Louvain.—Culinary. August–September. Fruit large, oval, deep-purple, with a thin bloom; flesh firm, yellowish, juicy, and richly flavoured. A heavy cropper, hardy, succeeds either on a wall, or as a standard or bush.

Belle de Septembre.—Culinary. October. Fruit large, roundish, oval, reddish-purple, with light-brown dots and thin bloom; flesh yellowish, firm, juicy, and fairly sweet. Should be grown against a wall, as the fruits are inclined to burst if grown in the open.

Bonne Bouche.—Dessert. September. A hardy Gage, suitable either for a wall or the open; very fertile as a cordon. Fruit medium, greenish-yellow; flesh golden-yellow, tender, juicy, of delicious flavour.

Boulouf.—Dessert. September. Fruit large, roundish, red, heavily dotted and blotched with russet, with a heavy bloom; flesh yellowish, tender, juicy, with a rich

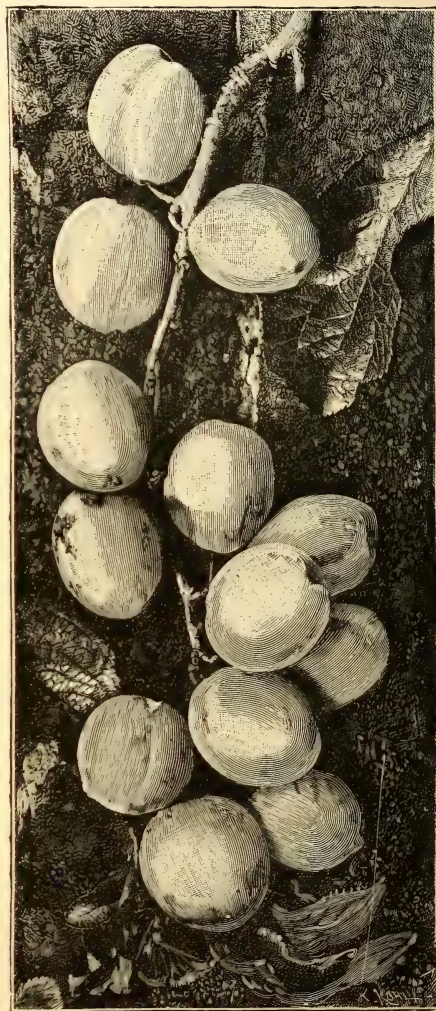


Fig. 953.—Plum. Coe's Golden Drop.

Gage-like flavour. Tree hardy, a good bearer as a cordon on an eastern aspect.

Brady's Green Gage.—Dessert. Late September. Fruit

very large, roundish, and sutured, greenish-yellow, with grayish bloom; flesh yellow, tender, juicy, flavoured like the old Green Gage, ripening a fortnight earlier. Best when grown against a wall.

Bryanston Gage.—Dessert. September. Hardier than Brahy's Gage; very prolific, either when grown as a bush in the open or against a wall or fence. Fruit like a Green Gage but larger, more golden in colour, richly flavoured and juicy. Is the result of crossing Green Gage and Coe's Golden Drop at Bryanston Park.

Coe's Golden Drop (fig. 953).—Dessert and Culinary. Late September. Fruit large, oval, greenish-yellow, freckled with dull-red on the side exposed to the sun; flesh greenish-yellow, adhering to the stone; very sweet, and deliciously flavoured when fully ripe. The fruits will keep long after they are gathered, either on the shelves of a fruit-room, or suspended by the stalk inside a window facing the sun, or wrapped in paper and kept in a dry room. The tree is a shy bearer when young, but is productive later. May be grown as a standard in the south and west, but in the north of England and in Scotland it requires an east or west wall, but one inclining to south-west is still better. Raised about a century ago by Mr. Coe, a market-gardener, near Bury St. Edmunds.

Coe's Late Red.—Dessert. October or November. Fruit medium, roundish, depressed at both ends, purplish-red, with yellow dots and azure bloom; flesh pale-amber, separating from the stone, crisp and juicy, with a rich vinous flavour when the autumn is fine. One of the latest to ripen. An excellent bearer as a standard in the warmer parts of the kingdom; elsewhere it requires the protection of a wall.

Count Althelm's Gage.—Dessert. September. Fruit large, handsome, of same shape as the Green Gage, greenish-yellow, mottled and dotted with red; flesh yellow, tender, juicy, exquisitely flavoured. Succeeds either as a cordon or trained tree on a wall, or as a bush in the open.

Czar.—Dessert and Culinary. Early August. Excellent either for private or market supply. Fruit medium to large, roundish, oval, sutured; skin fairly thick, blue-black, with a copious bloom; flesh yellowish, tender, juicy, and sweet. May be grown either against a wall or as a bush or standard. Raised by Mr. Rivers from Prince Engelbert and Early Prolific.

Denbigh (Cox's Emperor).—Culinary. Mid-September. Fruit very large, resembling Orleans, dark-red, with gray spots and bluish bloom, darkest on the side exposed to the sun; flesh yellow, firm, juicy, and sweet. Is a great bearer, and makes a good cordon for a wall.

Denniston's Superb.—Dessert. Mid-August. Fruit large, roundish, sutured, bright golden-yellow when fully exposed to the sun, and ripened on a wall or fence; flesh yellow, firm, juicy, with a rich Gage-like flavour. Does well in any form, and is particularly prolific as a bush or cordon.

Denyer's Victoria.—Culinary and Dessert. Late September. Fruit large, oval, red, with a thin light bloom; flesh yellowish, parting freely from the stone, moderately juicy, flavour agreeable. An excellent all-round Plum;

most prolific bearer as a standard, the branches often requiring support.

Diamond.—Culinary. Mid-September. Fruit very large, oval, deep-purple; flesh yellowish, coarse, juicy, and acid. A very vigorous grower and a good bearer. Does well as a bush.

Early Orleans (Wilmot's).—Culinary. Mid-August. Fruit similar to Orleans, but of a somewhat deeper violet

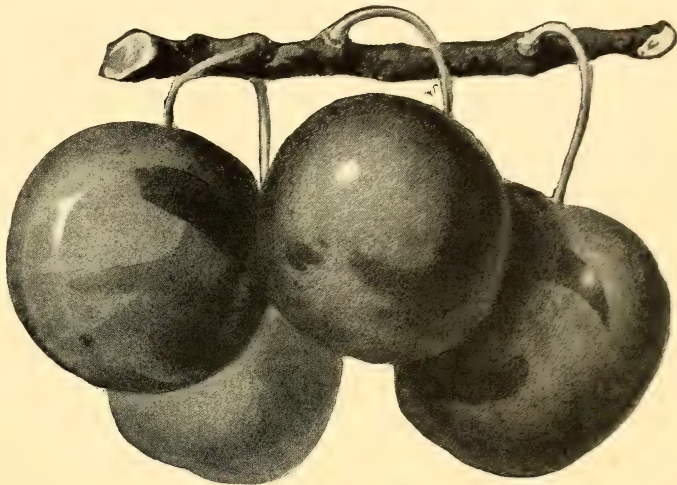


Fig. 954.—Plums. Early Prolific (Rivers'). Nat. size.

colour, and ripening a fortnight earlier. An excellent bearer, highly deserving of cultivation.

Early Prolific (Rivers') (fig. 954).—Dessert. Late July. Fruit medium, roundish, dark-purple, with a thin bloom; flesh yellow, juicy, sweet, agreeably flavoured. The best early Plum, largely grown for market. The tree is hardy, and bears most profusely either as a standard, bush, or trained against a wall.

Early Transparent Gage.—Dessert. Early August. Fruit large, roundish and flattened, yellow, mottled with red; flesh firm, juicy, and as richly flavoured as the Green Gage. A seedling from Transparent Gage, and is one of the most delicious of early Plums. Does best against a wall.

Golden Esperen (Drap d'Or d'Esperen).—Dessert. Late August or September. Fruit large, roundish, oval, yellow, with crimson spots on one side; flesh yellowish, separating easily from the stone, juicy, with a rich sugary flavour.

Golden Transparent.—Dessert. Late September. Fruit large, roundish-oval, bright golden-yellow when fully ripe; flesh rich, juicy, and deliciously flavoured. Should be trained against a wall.

Goliath.—Culinary. September. Fruit large, handsome, roundish-oblong, depressed at both ends, purple, bloom azure; flesh firm, greenish-yellow, coarse, adhering to the stone; Stalk downy, not smooth as in the Nectarine. Also known as St. Cloud, Steer's Emperor, Wilmot's late Orleans, Caledonian, and Nectarine.

Grand Duke (fig. 955).—Culinary. Mid-October. Fruit large, oval, deep-purple in colour, covered with a dense blue bloom; flesh yellowish, firm, and sweet. A variety of great excellence, raised by Mr. Rivers from Autumn Compôte. Is worthy of a place against a wall.

Green Gage.—Culinary and dessert. Mid-August. Fruit medium, round, with a small suture, pale-green,

faintly tinged with yellow, sometimes russet-red, and speckled on the side exposed to the sun; flesh pale-green, melting, juicy. Generally an abundant bearer, either as a standard or trained against a wall. It has also been called Isleworth Green Gage, Wilmot's Green Gage, Bradford Gage, Ahicot Vert, Damas Vert, Dauphine, Grosse Reine, Grosse Reine Claude, Reine Claude, Sucrin Vert, Verte Bonne.

Guthrie's Late Green.—Dessert. Late September. Fruit medium, roundish-oval, sutured skin, greenish-yellow, with a thin gray bloom; flesh yellowish-green, firm, rich, juicy, and excellent. A valuable late Gage, a good grower and bearer, fully deserving the protection afforded by a wall.

Heron.—Culinary. Early August. Fruit large, reddish-purple, of the freestone section. Being a very heavy cropper of great excellence, this is highly recommended both for garden and market culture. Raised by Mr. Rivers.

Huling's Superb.—Dessert. Mid-September. Fruit as large as the Washington, roundish-ovate, greenish-yellow; flesh pale greenish-yellow, parting from the stone, rich, juicy, and of excellent flavour.

Ickworth Impératrice.—Dessert. Early October. Fruit medium, obovate, purple, with golden lines radiating from the stalk or disposed in a circle, bloom bright-purple; flesh greenish-amber, partly adhering to the stone, juicy and very rich. Will keep several months if wrapped in paper and placed on a dry shelf. It also makes a good preserve. Raised by Mr. Knight, and named after Ickworth Park near Bury St. Edmunds.

Jefferson.—Dessert. Late September. Fruit large, roundish-oval, dark-yellow, speckled with purple and red, bloom thin; flesh deep orange, juicy, exceedingly rich and sugary. Tree a good grower and excellent bearer, either in the open as a standard or bush in warm localities, or against a wall in colder parts. Of American origin.

July Green Gage.—An early variety of the Green Gage, with golden-yellow fruit, not so rich in flavour as Green Gage. Is very prolific when grown against a wall.

Kirke's.—Dessert. Early September. Fruit very large and round, dark-purple, with small golden specks; flesh greenish-yellow, parting from the stone, firm, juicy, very rich, and Gage-like. Tree a good bearer, either as a standard or bush. Succeeds well on a north-western aspect in the West Midlands.

Large Black Imperial.—Culinary. Mid-September. Fruit very large, purplish-black, sutured; flesh yellow, firm, juicy, and sweet. Tree hardy, and a heavy regular cropper, either as a standard or bush.

Late Orange.—Dessert. Late October. Fruit large, roundish, orange-yellow, with a heavy bloom; flesh juicy and rich, parting freely from the stone. A new variety of great merit. Raised by Mr. Rivers.

Late Rivers.—Culinary. October–November. Fruit small to medium, roundish, dark-purple; flesh yellowish,



Fig. 955.—Plum. Grand Duke.

adhering to the stone, juicy, sweet, and richly flavoured. A valuable late Plum and a great bearer.

Late Transparent.—Dessert. Late September. Fruit large, round, greenish-yellow, with patches of red and purple, and a thin white bloom; flesh greenish-amber, firm and tender, juicy, and quite equal to Green Gage in flavour. A first-rate late Gage of the highest quality. Tree hardy, and a good bearer as a bush or standard, or when trained against a wall.

Lawson's Golden Gage.—Dessert. Early September. Fruit small to medium, oval, sutured on one side only, deep-yellow, speckled with crimson; flesh yellow, tender, juicy and richly flavoured. Tree hardy, bears well as a pyramid.

M'Laughlin's Gage.—Dessert. Mid-August. Fruit large, roundish, yellow, speckled with red; flesh greenish-yellow, tender, juicy, not equal in flavour to Green Gage. Tree hardy and prolific.

Mitchelson's.—Culinary. Early September. Fruit medium, oval, black; flesh yellow, parting from the stone, very juicy and sweet. A first-rate preserving Plum, and being an extraordinary bearer, is largely grown for market.

Monarch (fig. 956).—Culinary. Late September. Fruit large, roundish-oval, dark-purple; flesh very firm and juicy. Tree quite hardy, very prolific, succeeding either as a standard, cordon, or bush. A first-rate market kind. Raised by Mr. Rivers from Autumn Compôte.

Nectarine Plum.—Dessert and culinary. August. Fruit large, roundish, when not too thick on the tree, otherwise oval, reddish-purple, bloom thin; flesh tolerably rich, greenish-yellow, partially adhering to the stone. Tree a great bearer, frequently so much so that unless the crop is thinned the branches break down with the weight



Fig. 956.—Plum. Monarch (Rivers').

of fruit. Also known as Caledonian, Howell's Large, Jenkins' Imperial, Louis Philippe, Peach, Prune Pêche of some.

Orleans.—Culinary. Late August. Fruit large, roundish, depressed on the summit, purplish-red, with pale-red specks, bloom close, giving it a handsome Prussian-blue colour; flesh yellowish-green, firm, parting freely from the stone, fairly rich and juicy. Also known as Old Orleans, Red Damask, Monsieur.

Oullin's Golden.—Dessert. Early August. Fruit large, roundish oval, rich yellow with crimson dots; flesh yellow, slightly adhering to the stone, tender, rich, and juicy. A beautiful and first-rate Plum, and an abundant bearer. Also known as Reine Claude d'Oullins, Reine Claude Précoce.

Pershore.—Culinary. Mid-August. Fruit medium, obovate, yellow; flesh tender, with a slightly acid flavour.

Largely cultivated in the Evesham district for the markets of Birmingham and other large towns.

Pond's Seedling (fig. 957).—Culinary. Mid-September. Fruit very large, handsome, oval, dark-red speckled with gray, with a thin bluish bloom; flesh amber, juicy, with a brisk flavour. A valuable kitchen Plum, much grown for market. A hardy and prolific variety in the open.

Primate (fig. 958).

—Culinary. Late October. Fruit large, purplish-red, with thin bloom; flesh sweet, juicy, parting from the stone. The fruit hangs well after attaining maturity. A new variety of excellent quality.

Prince Englebert.—Dessert and culinary. Late August–September. Fruit very large and oval, deep-purple, with minute reddish dots and a dense-gray bloom; flesh yellow, juicy, rich, and sweet. A hardy variety, very prolific when grown as a standard.

Prince of Wales.—Culinary. Late August–September. Fruit resembling Orleans, but differs in having smooth instead of downy shoots. The tree is vigorous and a great bearer, but so tender and liable to



Fig. 957.—Plum. Pond's Seedling.

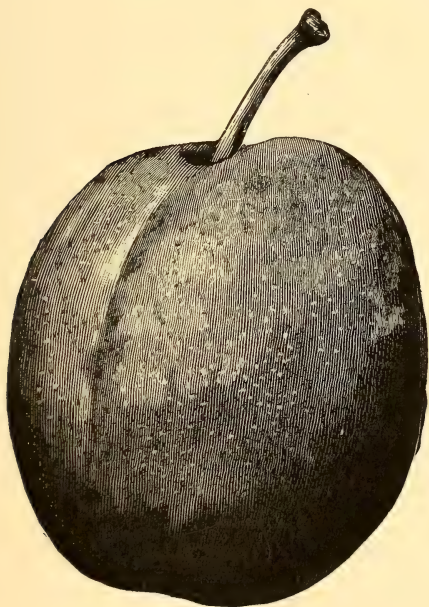


Fig. 958.—Plum. Primate (Rivers').

die off in an unaccountable manner that it is not grown so extensively now as formerly.

Red Magnum Bonum (Red Egg Plum, Red Imperial).—Culinary. Mid-September. Fruit large, oval, distinctly sutured, of irregular shape, deep-red, paler where shaded,

with small brown dots and thin bloom; flesh greenish, firm, juicy, and agreeably flavoured. Tree hardy, and a great bearer either as a standard or bush.

Reine Claude de Bavay (Monstreuse de Bavay, St. Claire).—Dessert. Late September–October. Fruit large, roundish, greenish-yellow, with a thin white bloom; flesh yellow, very juicy, rich, and sugary, of delicious flavour, separating from the stone. A valuable late Gage of first-rate quality. Should be grown on a wall.

Reine Claude Violette (Purple Gage, Violet Gage).—Dessert. Early September. Fruit medium, roundish, violet-purple with yellow dots, and a light bloom; flesh firm, greenish-amber, parting from the stone, sugary, rich, and excellent. Will keep in dry favourable seasons till October. The tree is a good bearer as a standard, and it deserves a place against a wall. It is also a good variety for orchard-house culture.

Royal Hative (Miriam).—Dessert. Early August. Fruit medium, roundish, purple, netted with yellowish-brown; flesh yellowish, parting from the stone, sugary, rich, and delicious. Wasps and flies attack it in preference to other sorts. The tree is a good bearer, and should be in all large collections, on account of the great excellence and earliness of the fruit.

Sultan.—Culinary. Mid-August. Fruit medium to large, round, deep-red, with a thick bloom; flesh greenish-yellow, juicy, agreeably flavoured. Tree a strong grower, bearing freely; considered to be an improved Prince of Wales. Raised by Mr. Rivers.

Transparent Gage.—Dessert. September. Fruit large, round, flattened, slightly sutured, pale-yellow, mottled with red; flesh yellowish, transparent, juicy, rich, and luscious. Fine for orchard-house culture.

Washington.—Dessert. Fruit very large, roundish-oval, dull-yellow, obscurely streaked with pale-green, flushed with red when well exposed to the sun; flesh yellow, parting freely from the stone, sweet and luscious. The tree is a shy bearer when young, but bears abundantly when older either as a standard or against a wall. The branches should be allowed plenty of space, so that the broad foliage can be exposed to the light. Raised in 1818 near New York. Also known as Bolmar, Franklin, Bolmar's Washington.

White Magnum Bonum.—Culinary. September. Fruit large, oval, yellow, with a thin whitish bloom; flesh firm, adhering to the stone, pale-yellow, juicy, crisp, not rich. This large handsome fruit is excellent for sweetmeats and preserving whole. Tree vigorous, and bearing freely both in standard and bush form. Also known as Yellow Magnum Bonum, Egg Plum, White Holland, Wentworth, Dame Auber, Dame Auber Blanche, Dame Auber Blanche Grosse Luisante, Imperiale Blanche.

Wine Sour (Rotherham).—Culinary. Mid-September. Fruit slightly larger than a Damson, obovate, purple; flesh greenish-yellow tinged with red, juicy and subacid. Excellent for jam. Tree a good bearer.

Wyedale.—Culinary. Late October. Fruit small, oval, purple, coated with a blue bloom; flesh greenish-yellow, juicy, briskly flavoured. Hangs for a long time on the tree in good condition. Tree a great bearer, either against a wall or in the open as a bush or standard. A famous old Yorkshire Plum.

List of twenty-four first-rate Dessert Plums.

Angelina Burdett, Bonne Bouche, Boulouf, Bryanston Gage, Coe's Golden Drop, Count Althem's Gage, Denniston's Superb, Early Transparent, Golden Transparent,

Golden Esperen, Guthrie's Late Green, Green Gage, Ickworth Imperatrice, Jefferson, July Green Gage, Kirke's, Lawson's Golden Gage, Late Orange, Late Transparent, Oullin's Golden Gage, Reine Claude de Bavay, Reine Claude Violette, Transparent, Washington.

List of Twenty-four first-rate Culinary Plums.

Archduke, Autumn Compôte, Belgian Purple, Belle de Louvain, Belle de Septembre, Coe's Late Red, Czar, Diamond, Early Prolific, Goliath, Grand Duke, Large Black Imperial, Late Rivers, Mitchelson's, Monarch, Orleans, Pond's Seedling, Prince Englebert, Primate, Red Magnum Bonum, Sultan, Victoria, White Magnum Bonum, Wyedale.

DAMSONS.

Bradley's King.—Late September–October. A very fine-flavoured variety, a great bearer, succeeds well on a shallow soil. Much grown in Kent for market.

Common or Round.—September. Fruit small, roundish-oval, blue-black, with azure bloom; flesh firm, yellowish-green, parting from the stone, acid and astringent. Much used for pies and for preserving. A great bearer.

Crittendens.—Mid-September. Fruit roundish-oval, small, black; flesh greenish-yellow, sweet when thoroughly ripe. A most prolific cropper, and may be grown as a bush.

Herefordshire Prune.—Late September. Fruit large, obovate; flesh firm, yellowish-green, juicy, and quite the



Fig. 959.—Damsons.

sweetest flavoured of all the Damsons. Is a much heavier cropper than the Shropshire Prune, and the fruit is larger, but the growth is less robust. The branches droop as the tree attains age.

Prune or Shropshire.—Fruit large, obovate, black, with dense blue bloom; flesh greenish-yellow, firm, juicy, sweeter than the common Damson, sometimes slightly bitter, excellent for preserving. Much prized in Shropshire and Cheshire, where it is extensively grown. Is not such a heavy cropper as Crittendens.

BULLACES.

The chief distinction between the Bullace and Damson is in the shape of the fruit, which is round instead of oval, and in the colour, which is white.

The three best varieties are White (fig. 960), New Large Bullace, and Shepherd's White.

FORCED PLUMS.

The Plum, like the Cherry, requires but a slight amount of forcing to bring the fruit to perfection. The house in which the trees are grown may be either lean-to or span-roofed; it should also be roomy, airy, and light, with sufficient hot-water pipes to exclude frost.

The trees may be either planted out, or grown in pots or tubs; the latter method, perhaps, being preferable, as it admits of their being removed to the outer air after the fruits are gathered to ripen and rest.

If planted out, the border should be 3 feet in depth, and if at all damp, or if water rises in the spring, the bottom should be concreted and

a drain provided to carry off the surplus water. The border should consist of about a foot of drainage, and 2 feet of good turfy loam. Plums require a liberal quantity of water throughout the growing season.

Trees grown in pots or tubs should be well drained, and it is necessary to stand them on three or four bricks or tiles to allow the water to get away, and to prevent worms getting into the pots. A temperature of 45° at night and 50° by day will be high enough to start with. The soil in the border and in the pots should then be thoroughly watered with tepid water. After this take advantage of a calm evening to vaporize the house as a precautionary measure, as the Plum, under glass, is very liable to become infested with aphids. Ordinary tobacco-paper will suffice for fumigating, but one of the vaporizing compounds now in use is much more pleasant to handle, and certainly more effective in killing the insects. Unless aphids should put in an appearance in the interval, this one application will suffice until the flowers are about to expand, when a second fumigation is desirable. This will carry them over that stage, or until the fruit is set, when an occasional vaporizing and vigorous washing with a garden-engine should keep them clean.

When the buds begin to push, increase the temperature to 50° – 55° and syringe the trees twice a day with tepid water. Previous to this a light syringing every morning suffices. Maintain a dry atmosphere whilst the trees are in flower, and set the flowers with a camel-hair brush about the middle of the day. Ventilate as freely as circumstances will permit during the forenoon, to ensure the pollen being free and dry, and if the weather is mild a chink of air may remain on at the front and top ventilators throughout the night. Resume syringing as soon as the fruit is set, and if the set is heavy, thin the fruits with a pair of fine grape scissors. With regard to the amount of fruit to have on each tree, this should be governed entirely by the size, age, and health of the trees,

and these are matters best determined by those under whose charge the trees may be. This much may be said, always avoid over-cropping, and at the same time do not err in the opposite direction, otherwise the trees will rush to strong growth.

The growths on the spurs and branches should be stopped to about four buds, leaving leaders and terminal shoots their full length if required for extension purposes, otherwise pinch them at

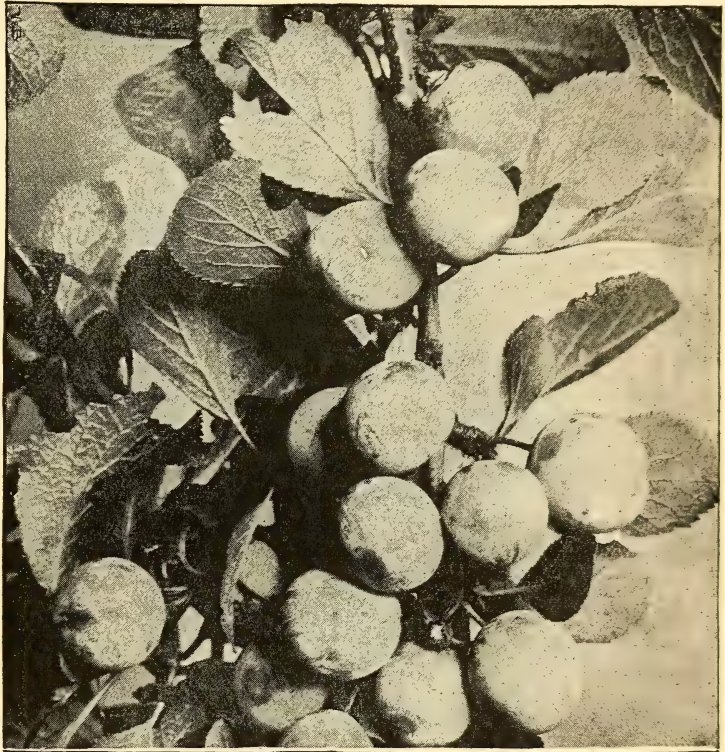


Fig. 960.—White Bullace.

the fifth or sixth leaf. This pinching or stopping is best done while the shoots are young and tender. Unless the trees are aged they will require to be pinched several times during the season. A good look-out must be kept for caterpillars. After the stoning period is safely passed, a higher temperature may be maintained to hasten the fruits to maturity, or sun-heat alone may maintain the requisite temperatures if air is shut off early in the afternoon to run the heat up to 65° or 70° . When hot weather sets in, the house will need to be aired abundantly, and the trees washed either with a syringe or garden-engine twice a day.

Mulching the surface of the border and pots with rich compost must not be neglected, and the roots must not feel the want of water at

any time. In addition to this, liquid or artificial manure may be administered pretty frequently, as a good crop of fruit creates a heavy demand on the roots. When the fruits begin to ripen, gradually dispense with overhead syringing, and frequently sprinkle the paths and border surfaces with water and with old stimulants. On dull or wet days a little fire-heat will prevent moisture from disfiguring the fruits. The best sorts for forcing are:—Early Prolific, Czar, Early Transparent Gage, July Green Gage, Count Althem's Gage, Reine Claude Violette, Bryanston Gage, Denniston's Superb, Oullin's Golden Gage, Late Transparent Gage, Belgian Purple, Sultan, Monarch, Washington, Angelina Burdett, Coe's Golden Drop, Jefferson, Kirkes, Reine Claude de Bavay. [A. W.]

JAPANESE PLUMS.

In the United States particular attention has been paid for some time to the Japanese Plums, in the belief that they will prove adapted to that country, and add a race of varieties with qualities different from those of what are there known as the European (domestica) race. The following is a *precis* of an account of some of them, which was published in the form of a *Bulletin* in 1899, under the signature of Mr. L. H. Bailey. These new Plums are receiving attention from British growers, and it is probable that some of them will before long find general favour, either for their distinct flavour or the time when they are ripe. It will be noticed that several are recommended for their keeping qualities.

For five years and more the Japanese Plums have been the subject of careful study at Cornell, and an effort has been made to secure all the varieties. During the past season the crop of these Plums has been large and excellent, and the following notes are made directly from the fruits. We are convinced that the Japanese Plums are a very important addition to our orchard fruits. They will not drive other Plums from the field, but they have attributes which make them an excellent supplement to the European and native sorts. The particular merits of the Japanese Plums are their great productiveness, adaptation to a wide range of territory, beauty, earliness of many of the varieties, comparative freedom from diseases and insects, and long-keeping qualities of fruit. Most of the varieties tend to overbear, and good fruits can be secured only by very severe thinning. This is especially true of Burbank,

Abundance, and Red June. There is great range in quality, the poorest of them being inferior and the best of them nearly equal to the best of the European kinds, whilst all of the leading sorts are better in quality than the Lombard, if they are properly thinned and ripened.

A great merit of the Japanese Plum is the fact that it is adapted to an exceedingly wide range of territory, in this respect excelling both the domestica and native types. There are varieties which thrive from Canada to the southern States, and apparently from ocean to ocean. There has been some complaint in the Middle states and the South of loss of blossoms from late spring frosts, but we have never experienced this difficulty. The buds start early; but in New York State, at least, the winter climate holds so late that there is practically no danger from the early swelling of the buds.

The Japanese Plums are less seriously attacked by insects and fungi than the common European or domestica type is. They are not entirely free from the shot-hole fungus, black-knot, curculio, and other difficulties; but in our experience these troubles have been so infrequent or of such minor importance as not to attract serious attention. The fruit-rot is often serious on the Japanese Plums, but in our experience it is equally or even more serious on the Lombard. If the Japanese Plums are properly thinned, there seems to be no unusual susceptibility to the fruit-rot fungus.

Most of the plants of the Japanese Plums sold by nurserymen are on Peach stocks; and on these they seem to thrive. However, we find that they do remarkably well when top-worked on Lombard stocks. Theoretically, we are to expect the best results when they are worked on their own roots; and these Plums are now so extensively planted that the time cannot be far distant when seed can be obtained cheaply enough to warrant the raising of Japanese Plum stocks. It remains to be demonstrated, however, whether the Japanese Plum roots are actually better than the Peach or the domestica Plum roots.

In former reports, we have spoken of the great variation of Japanese Plums in respect to the period of ripening. We find that the same trees often do not ripen their fruit in the same sequence in different years. In some years there may be a difference of two weeks in ripening between the Abundance and Burbank, whereas in other years the very same trees may ripen their fruit almost simulta-

neously. The period and sequence of all fruits are greatly modified by the particular season, but the Japanese Plums seem to be particularly unstable in these respects.

Ever since we began the study of these Japanese Plums we have been puzzled to account for the great differences in opinion respecting the merits of individual varieties and the wide discrepancies in descriptions of them. Some of these discrepancies are traceable to a confused nomenclature; but we now believe that many of them are due to the fact that the same tree may bear unlike fruit in different years. Some of the trees which we have had under the closest observation during two or three crops seem to have behaved in this way. For example, in our last report we thought that the Chase is identical with the Chabot. This year, however, the fruit of the same trees of Chase was indistinguishable from Abundance; and yet, between Abundance and Chabot there is normally a difference of two to three weeks in the period of ripening, and there was this difference on our own grounds this year. From this year's study, therefore, we are obliged to say that the Chase is the Abundance.

Some objection has been raised to the supplanting of the Japanese names with new names. We are convinced, however, that the dropping of the Japanese class-names and adjectives is legitimate in the interest of perspicuity. Most of the Japanese names have been loosely applied, and it is impossible, in many cases, to determine any one variety to which the name may be said to belong. To use the old name of Botan, for example, would result in perpetuating a confusion, since any person who had a Plum under the name of Botan, no matter what it was, would feel justified in sending it out. When, however, the different kinds of Botans are given specific names, the person must distinguish his variety before it can be put upon the market. The same remarks may be made for the Japanese names, Hattankio, Yosobe, Sumomo, and Wassu. (Wassu is probably a misspelling of Wasse, or Wase, meaning *early*.) There are two or three Japanese names, of which Maru and Satsuma are examples, which have been applied to one particular variety; and in these cases we have held to Japanese vernacular.

It is usually unsafe to make a general recommendation of varieties of any fruit. The value of a variety lies not only in its intrinsic merits, but in its adaptation to the personal likes of the grower, and to markets, soils, and other extrinsic conditions. However, as a guide in the choice of varieties, I will mention those kinds which now seem to me to be most valuable for general uses and conditions. In the first list I place those which seem to be worthy of general planting; in the other list are those of secondary value, and those which must be further tested before they can be confidently recommended. The varieties are named in the order in which they ripened at Ithaca in 1899:—

First list.

Engre
Lutts
Red June
Abundance
Burbank
Chabot
Satsuma

Second list.

Berger
Kerr
Ogon
Georgeson
Hunn
Hale
Wickson



Fig. 961.—Japanese Plum. Abundance.

We have said that the varieties are arranged in the order of ripening at Ithaca in 1899; but, as already indicated, this order is not uniform year by year. By season of ripening, we mean the date at which the first considerable numbers of fruits are fit to be eaten from the hand. Ordinarily, the varieties should be picked for market three or four days, or even a week, earlier than the dates here given.

It is characteristic of most Japanese Plums, that even though they are uncoloured when picked, they ripen if kept in a cool and dry place.

Abundance (fig. 961).—Fruit medium to large when thinned, round-oblong, the suture more

grower, and the fruits are borne well down on the older wood. We believe that the *Berger* is well worth growing in every garden.

Burbank (fig. 962).—Fruit medium, larger upon vigorous and well-thinned trees, round-oblong; colour orange-yellow overlaid with splashes, streaks, and dots of red, giving a more or less marble appearance, but becoming more or less uniformly red on the cheek; flesh firm and meaty, yellow, sweet and rich, clinging. Ripe mid-August. Tree an exceedingly spreading flat-topped grower, and needs strong heading-in to keep it in shape. When well thinned the fruit is large and of excellent quality, perhaps as good as any of the Japanese Plums. It is also a good keeper. It usually colours upon the tree some days before it is ripe. In many cases the fruit does not become soft and edible even when apparently full ripe. Heretofore we have regarded *Burbank* as the best all-round Japanese Plum, but we are now inclined to give that place to *Abundance*.



Fig. 962.—Japanese Plum. Burbank.

or less prominent; colour pink-coppery-red, marked with many minute dots and a thin bloom; flesh firm but juicy, sweet, with no trace of mawkish or Almond flavour when well thinned or well ripened. Ripe early in August.

An excellent Plum, and one which most people delight to eat. Its great fault is to overbear, and in that case it is very liable to the fruit-rot fungus. With us it has been less injured with this fungus than the *Lombard*. Tree an upright grower. I believe *Abundance* is the best single variety of Japanese Plum.

Berger.—Small and Cherry-like, flattened endwise, bright light-red, with prominent bloom; flesh firm and meaty, yellow, free; skin not tough nor sour. Ripe mid-July. This is one of the most distinct of all the Japanese Plums. It has the flavour of some of the domestic varieties. The handsome little fruits fall when ripe, and

should be caught on straw or hay spread underneath the tree. They are not much larger than Cherries, and, coming after the sweet Cherries are gone, they seem to piece out the Cherry season. The tree is a distinct and upright

Chabot (fig. 963).—Fruit medium to large, oblong-conical, the suture usually pronounced; colour deep-orange, red on the sunny side, with a whitish bloom and many minute golden-yellow dots; flesh soft to firm, yellow, with no



Fig. 963.—Japanese Plum. Chabot.

Almond flavour, sweet, of excellent quality, clinging. Ripe early September. Tree a strong, upright grower, prolific, the fruit handsome, good, and long-keeping. One of the best of the Japanese Plums.

Earliest of All.—Small, round-oblong; colour when fully ripe almost uniformly pink-red, with light bloom; flesh light-yellow and soft, clinging, sour, with a decided Almond or bitterish flavour; skin tough. Ripe on July 14. The fruit drops from the stem as soon as ripe. The tree is a decidedly upright grower. Its chief merit is earliness.

Engre.—Larger than Earliest of All, somewhat flattened endwise, the suture usually prominent; colour darker; flesh soft and yellow, clinging, sour but with almost no Almond flavour, and the skin tough. Ripe mid-July. A prolific bearer, and the fruits are attractive. Its quality is not as good as that of Burbank and Abundance, but its great earliness commends it.

Georgeson.—Fruit medium to large when well thinned, round, usually without a point, the suture distinct; colour bright-yellow with a heavy whitish bloom; flesh firm and solid, golden-yellow, of fairly good quality, clinging. Ripe mid-August. Tree a sprawling grower. The fruit is a long keeper, and, if picked before it is thoroughly ripe, will ordinarily shrivel before it decays. The quality is medium; it has a little of the mawkish Almond flavour, and is usually not prized for eating from the hand.

Kerr.—Fruit fairly large when well thinned, tapering to a very distinct long point, the suture usually well marked; colour orange-yellow, overlaid with a thick creamy bloom; flesh firm and rather meaty, yellow, clinging, sweet and of fair to good quality when well ripened. Ripe late July. Tree of moderate spreading habit. An exceedingly productive variety; needs to be well thinned to produce the best results. It is one of the best of the yellow varieties. Its chief fault is that it tends to fall before it is fully coloured, but the fruits ripen and colour on the ground. If they are picked just before they begin to loosen from the stem and are stored or shipped, they will ripen up well.

Lutts (fig. 964).—An excellent early Plum. Fruit round-oblate, in general form and appearance very like the Burbank, but running smaller; colour dark-red, marked with many very fine golden dots and covered with a heavy bloom; flesh light-yellow and soft, clinging when thoroughly ripe, with only a tinge of

Almond flavour; skin rather tough. Ripe mid-July. This is the largest and best very early Japanese Plum which we have tested. The tree is a good grower and productive.

Ogon.—Fruits medium or large when heavily thinned, globular, not at all conical or pointed, the suture prominent; colour a clear lemon-



Fig. 964.—Japanese Plum. Lutts.

yellow, with a heavy whitish bloom, rarely with the faintest indication of a blush cheek; flesh thick and very meaty, comparatively hard, free, with a very peculiar musky Almond flavour. Ripe end of July. Tree a strong, upright grower with heavy thick foliage. Not so uniformly productive as some other varieties, although it tends to bear very heavily at times. Quality not so good as that of the Red June. It is said to be one of the best for canning.

Red June.—Fruit medium to large, cordate-oblong, distinctly pointed, often lop-sided; colour deep vermilion-red, with a thick and handsome bloom; flesh light-yellow, clinging or partially so, firm and moderately juicy, slightly acid to sweetish, of good quality though not very rich, the skin slightly sour. One of the very best of the Japanese Plums, because it is very handsome and productive. It varies considerably in season of ripening. This year the earliest fruits were ready for eating on July 30. A bushy-topped, upright grower.

Satsuma.—Fruit medium to large, round-oblong, with a deep suture; colour dark brown-

red with a heavy bloom, mottled with greenish dots; flesh hard and blood-red, clinging, rich and pleasant when fully ripe. Ripe early September. A very long keeper. We believe that it is one of the coming Japanese Plums. The red flesh may be against it in many markets. It seems to be an excellent Plum for culinary purposes. Tree moderately spreading, distinguished by its habit of bearing spurs and short branches all along the main forks or branches of the top.

Wickson.—Fruit very large, tapering, heart-shaped with a deep strong suture; colour maroon-red to yellowish-red; flesh firm and meaty, dull-yellow, rich but with an aromatic Almond-like flavour, clinging, the pit small. Tree a very narrow upright grower. Fruit borne far down on the old wood and not in clusters. Does not come into full bearing as early as other varieties of Japanese Plums. From its habit of bearing far down on the old wood, and the comparatively small amount of wood surface which it makes, it promises not to be a very prolific variety, although it is possible that when the trees arrive at a greater age they may bear full crops. Ripe early September.

[A. W.]

CHAPTER VII.

THE PEACH AND NECTARINE.

SITUATION—PLANTING—PRODUCTION OF FRUIT—PRUNING AND TRAINING—THINNING THE FRUIT—OTHER CULTURAL MATTERS—GATHERING THE FRUIT—DISEASES—CULTURE UNDER GLASS—MANURES—RESTING PERIOD—POT CULTURE—PACKING—PROPAGATION—INSECT AND OTHER ENEMIES—LISTS.

The origin of the garden races of Peaches and Nectarines is now generally admitted to be Chinese. They are both forms of *Prunus* (*Amygdalus*) *persica*, the Peach having a downy and the Nectarine a smooth skin. They have been cultivated from a remote period. According to De Candolle,¹ the Peach spreads easily in the countries in which it is cultivated, so that it is hard to say whether a given tree is of natural origin and anterior to cultivation, or whether it is naturalized. But it certainly was first cultivated in China; it was spoken of there two thousand years before its introduction into the Greco-Roman world, a thousand years, perhaps, before its introduction into the lands of the Sanskrit-speaking race.

¹ *Origin of Cultivated Plants*.

The facility with which Peach-trees are multiplied from seeds in America, and have produced fine fleshy fruits, indicates that little change has been wrought by long cultivation or hybridization. The varieties of recent origin are certainly either seedling sports or the result of crossing one variety with another.

The late Mr. Rivers, who raised many seedlings of both Peaches and Nectarines, found that some of the varieties came true from seeds, viz.: Royal George “reproduces itself from seeds with rare exceptions”; Noblesse, “very rare to find the least deviation”; Grosse Mignonne, “out of twenty seedlings it is rare to find much deviation from the parent stock”; Walburton Admirable (fig. 965), “reproduces itself from seeds”. There are numerous recorded instances of a Nectarine originating from the seed of a Peach, and *vice versa*. Also of the same tree bearing both Peaches and Nectarines, as well as fruit in part Nectarine and in part Peach (fig. 966).

The Peach is extensively grown between latitudes 30° and 40°, in Asia, Europe, Africa, and America. Under circumstances particularly favourable, it will succeed considerably beyond these limits, but its deciduous nature requiring a period of rest, it is not fitted for a tropical climate. On the other hand, beyond lat. 48° the ground is too cold for its roots, and it will not long continue to thrive unless budded on some hardier species; the tree, also, requires the shelter of a wall or other artificial means of protection. If the summer is hot enough to ripen the wood, it will stand a severe winter uninjured; but this is not found to be the case with trees in the open ground, if the young shoots have been grown under too low a temperature. In localities where the mean temperature of February is 40°, and that of March 44°, the Peach-tree will be in full flower against a south wall in the last week in March; and if the mean temperature of April is 49°, that of May 55°, June 61°, July 64°, and August 63°, the season may be considered a favourable one. The general crop in that case will be ripe in late-August or first week in September, and the fruit be of a high degree of perfection.

By artificial means, or in a warmer climate, the above period of five months from the time of flowering to that of ripening may be reduced to four, but not advantageously to a shorter period, except in the case of very early varieties. From the above it will be seen that the Peach flowers at a comparatively cool period. The blossoms may be destroyed by too much heat,

but not by cold, unless actually frozen; therefore no warmer coverings than are just sufficient to keep out frost are necessary.

OPEN-AIR CULTURE.

Soil and Situation.—In the British Islands the Peach requires a wall. In the southern parts of

that the shoots will be imperfectly ripened; therefore draining must be effected, if possible, in order to carry off all moisture that would otherwise be stagnant. If this is impossible for want of fall or outlet, then the level above which drainage may be carried out should be ascertained, and a moderate depth of soil raised above that level; for it is better to raise the border at the expense of losing say 1 foot of height of wall, than to plunge the roots to that depth in a medium which will prove injurious. In the one case, they would absorb nourishment conducive to the health of the whole tree, by encroaching only on the height of the wall to the extent of space for a pair of lower branches; in the other, being situated in stagnant moisture, they would draw watery vitiated nourishment, and supply it to the whole tree. It is therefore better that two branches be entirely dispensed with, in order to have the rest well fed, than that all should be improperly nourished, and consequently the fruit deteriorated.

Having adverted to subsoils that are too wet for the Peach, and the most obvious remedy, it will now be necessary to direct attention to those which are too dry. Where the soil is naturally shallow and resting on a subsoil that

the kingdom it will succeed on an east or west aspect, if the locality is not too elevated and exposed to cold winds, nor, on the other hand, too low and subject to damp and fogs, in consequence of which the wood does not become perfectly ripened. But the most favourable situation is a wall with a southern aspect. As the Peach requires to be trained against a wall, it follows that its roots must occupy a border in front. If this is made as recommended in the chapters on the formation of the fruit and kitchen garden, it will be fit for the reception of the Peach. In old gardens, or others in which the borders have been formed, some improvements ought to be made before young trees are planted. It will therefore be necessary to point out, first, the soils, subsoils, and other circumstances which are unfavourable to healthy growth, so that they may be avoided or remedied.

The subsoil should be first examined as to its condition with regard to moisture. If it is too wet, the trees will not thrive so long as their roots are in a saturated medium, especially whilst this remains in a cold state, neither will the fruit, under such circumstances, progress favourably. If, however, after midsummer, the moisture should become warm, the trees will not unlikely grow rapidly, but so late in the season

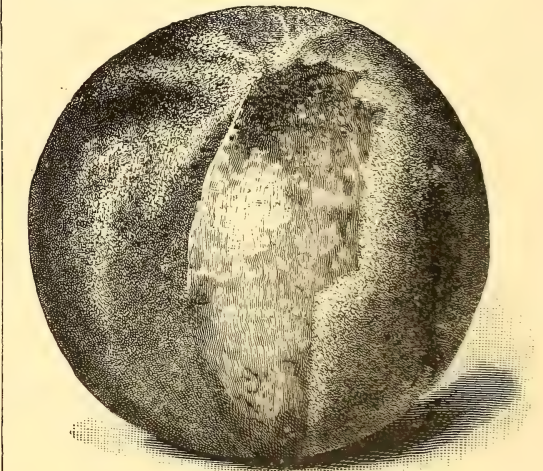


Fig. 966.—Fruit, part Peach, part Nectarine.

is dry and gravelly, it often happens that the tree suffers much from want of moisture in dry weather. Exposed to the accumulated heat of the sun's rays, often above 100°, the leaves evaporate an astonishing amount of moisture

as long as the roots can supply it. Whilst any moisture is to be found within their reach, they will rapidly absorb it; but when all is exhausted their action must cease, and the condition of the tree must undergo a change for the worse, for it cannot be supposed that the foliage that was in a healthy state whilst evaporation was fully supplied, can continue in the same state when that supply is almost entirely stopped. Although the supply of moisture from the roots may have ceased, evaporation will still continue, drawing, to a considerable extent, from the juices of the tree; then it is that the red spider commences its most determined attacks, and this, if not arrested, would almost ruin the tree in one season. In order to conquer this small enemy, much labour must be employed, large quantities of water must be wheeled about, the engine must be kept at work, and, after all, the trees will not be so healthy as those that in properly made borders do not require one quarter of such labour to be expended upon them. In many cases, one year's expenditure in watering and syringing, if laid out in thoroughly preparing the border before planting, would effect an annual saving of nearly an equal amount.

As much should therefore be done in the first instance towards remedying the natural defects of the border as circumstances will permit. The dry gravelly subsoil ought to be dug out to the depth of $2\frac{1}{2}$ or 3 feet. Although the bottom may be dry, yet, with a good depth of soil, the trees will not suffer readily from drought. When soil of the depth of $2\frac{1}{2}$ or 3 feet is well moistened, either by rain or watering, it takes a considerable time before the trees can suffer from drought.

With regard to the quality of the soil, if the ground is old and worn out, or if trees have long been grown in it, it is not proper for the Peach. If it cannot be changed, it should be refreshed with other soil. If there is a stratum of loam below, let a considerable portion of it be brought up to the surface, and as much of the top soil turned down to the bottom, there to be dug over, mixing it at the same time with a portion of the loam and some broken limestone, or mortar rubbish, in order to ensure thorough drainage of the border, and to supply the tree with carbonate of lime, a large quantity of which is required when the fruit is stoning. The proportion of mortar rubbish to be added will depend on the character of the soil, and will vary from one to two ordinary barrow-loads to each cart-load, the former for light sandy loam, the latter quantity for more retentive soils. These

should also have one-eighth part of burnt earth added. This helps to keep the border open and sweet, and supplies potash and other minerals to the roots.

When black, worn-out soil is turned down in the bottom of trenches with previously undisturbed yellow loam above it, trees grow vigorously as soon as the roots get down to the black soil, although in this, when it was at top, they did not thrive, doubtless in consequence of the small amount of inorganic matter which such soil contains.

If the soil is poor and sandy, the trees will not find nourishment to enable them to support a good crop; yet, as it can afterwards be enriched by suitable composts, it is preferable to soil that is too adhesive. Stiff clays are most unfavourable, and the most difficult of any to deal with; in fact, the Peach ought not to be planted in such. The best plan is to remove the whole, and replace with soil of a more friable nature if possible. This may prove too expensive an operation for some persons to perform at once, but as much as 4 or 6 feet square might be cleared out where the tree is to be planted, and afterwards an additional portion could possibly be removed in advance of the roots, and exchanged for soil from an open part of the garden, where the stiff soil can be subjected to processes for amelioration which it could not be conveniently made to undergo in a border, and which will render it suitable for some kitchen-garden crops.

At Montreuil, where the culture of the Peach is extensively carried on, the soil is by no means rich; it appears to be a calcareous sandy loam, of a yellowish-brown colour, and seems to be too poor for corn crops. In the grounds of M. Lepère, one of the most skilful cultivators, the borders are prepared, to the distance of 5 or 6 feet from the wall, by trenching 2 feet deep, and mixing well the soil with manure. Afterwards, when the trees come to bear heavy crops, a little manure is forked into the border. The success of the Montreuil cultivators, no doubt, depends on the sun-heat being greater, their mode of pruning, and other means which they adopt with the view of promoting an equal distribution of the sap.

Although there is proof that a border 6 feet wide will answer, yet a greater width will in most cases answer better. We know that Peaches may be grown in pots, and, with the advantage of rich soil, a dozen of fruits may be grown to fair size; but a well-grown tree against a wall may bear as many as forty dozens, and



TRELLIS IN A PEACH-HOUSE AT THE HENDRE, MONMOUTH.

to obtain nourishment to support such a quantity the roots must have considerable scope. As space on a south border is required for various early crops, the breadth may be 12, 15, or 18 feet, according to the size of the garden. Where an artificial border has to be made, its width is often necessarily limited to correspond with a certain amount of outlay. In that case, the made portion of the border should not be less than 6 feet, but 8 feet at least would be desirable. It should be made and kept very firm, and no digging should be practised near the roots.

From what has been stated, it will be understood that, in preparing a border for Peach-trees, the extremes of wetness and dryness must be remedied by such means as have been pointed out. As to the quality of the ground, any good fresh soil will answer, provided the trees are well managed.

Planting.—The border having been prepared, the next consideration is the distance apart at which the trees should be planted. In good soil and a warm situation, this may be 20 feet; where the soil is not very rich—which indeed it ought not to be, or where the climate is rather cold—the distance may be somewhat less, say 18 feet, and it may be 15 feet; but less than this must be considered too limited for fan-training.

The best season for planting is the autumn, for the vegetation of the Peach takes place early in spring, and when the plant is then removed it receives a check which is injurious to it. When a young stem is cut back after the sap is in full flow, and the buds expanding into leaf, the portion of stem left has in consequence its internal structure much deranged; and although it may keep alive and be covered with young layers, yet, if the stem were cut over many years afterwards, all the portion of wood formed previously to the heading back will appear discoloured. On the contrary, a young stem cut back when the sap is comparatively at rest, or before winter, may die back a little way immediately below the section, but elsewhere it will exhibit little appearance of derangement in its vegetation. If it should happen that the planting cannot be done before vegetation commences in spring, the plants should be taken up early in February, and healed in a cool shaded place, till the final planting can be performed. When the plants are cut back before they are taken up, they

should not be cut quite so low as they would require to be when planted against the wall, in order to leave a choice of well-situated buds, to which they can then be cut.

The trees should be planted as deeply in the soil as they were before removal, and about 6 inches from the wall. Some recommend the tree to be planted with the budded part outward, but this is immaterial; indeed, if there is

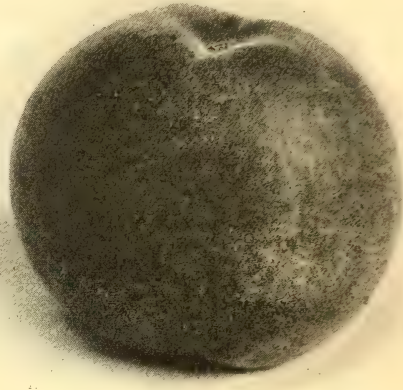


Fig. 967.—Peach. *Crimson Galande*. (3.)

any wound, it will heal sooner on the south side than on the opposite one, especially if shaded from the sun's rays, because on the former thicker layers of wood are deposited. The mode of planting detailed in the case of the Plum, &c., is also applicable to the Peach. When planted it is well to mulch as far as the roots extend with stable litter.

Production of Fruit.—As all the parts of a tree, except the root, proceed from a single bud, it will be necessary, for the sake of precision, to distinguish the progressive stages of the growth of those parts. The bud produces a shoot on which, during the summer, leaves and buds are developed. From the time that this shoot pushes in spring till its leaves drop in autumn, we propose to designate it as a young shoot. From the time that the young shoot ceases to elongate for the season, becomes mature, and drops its leaves in autumn, until it begins to push young shoots in spring, we shall call it a shoot. After the shoot begins to push buds and form young shoots, it may be called a young stem if occupying the position of a stem; if otherwise, a young branch. After the young branch has matured shoots, or when it is two years old, it may be termed a branch.

As the young shoot proceeds in growth,

leaves are produced at every node or joint, singly, in twos, or in threes; and in the axils of each leaf either flower-buds or leaf-buds are

young shoot can proceed from it, and it will ultimately die back to the nearest leaf-bud below the section.

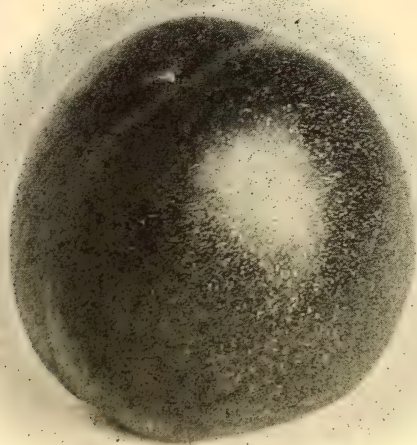


Fig. 968.—Nectarine. Pine Apple. (3.)

formed. In the following spring the blossoms open before the leaf-buds expand, and in the course of the season the fruit is brought to maturity. The fruit is also occasionally borne on short shoots somewhat resembling spurs, which are terminated by a cluster of blossom-buds, with a leaf-bud or growing point in the middle, and which, instead of growing, remains almost stationary. Spurs of this sort are, however, of rare occurrence in trees that are managed so as to be properly furnished with successional bearing shoots. Such spurs should not be encouraged on trees trained to walls or trellises, as they are apt to snap off when the fruit gets heavy. For bearing the crop, we ought to depend on shoots and not on spurs, therefore the latter need not be further noticed here.

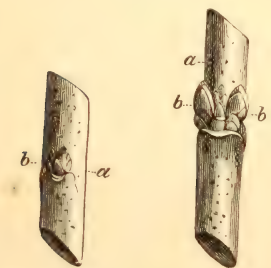


Fig. 969.—Peach. Double Eyes.

Fig. 970.—Peach. Triple Eyes.

Fig. 969 represents part of a branch with double eyes, that is, a leaf-bud *a*, and a flower-bud *b*. Triple eyes are represented in fig. 970, and consist of a leaf-bud *a* between two flower-buds *b b*.

It is necessary to be able readily to distinguish leaf-buds from flower-buds; for if, in pruning, a shoot is cut back to a flower-bud, no

Leaf-buds *a*, figs. 971 and 972, are of a conical, pointed form, and consist of scales surrounding a growing point, which, under favourable circumstances, pushes and becomes a shoot; but many of them remain dormant, especially if the shoot is weak and left at full length. When, however, the shoot is shortened to a leaf-bud, that bud, stimulated by the sap that would otherwise flow towards the extremity, is almost sure to push.

Flower-buds *b*, figs. 971 and 972, consist of scales, which enclose, not a growing point, but the rudimentary flowers. They are ovate, and gradually become globose, assuming then a hoary appearance, from the scales opening and exposing their downy integuments. They are likewise much plumper than the leaf-buds.

It will be observed, on referring to the accompanying figures, that some buds are single leaf-buds, others are single flower-buds. Frequently the buds are double—one being a flower-bud,

the other a leaf-bud, or both may be flower-buds; and lastly, some are triple buds. These generally consist of two flower-buds with a leaf-bud between



Fig. 971.—Peach. *a*, Wood; *b*, flower-buds.

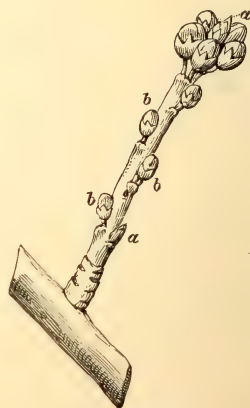


Fig. 972.—Peach. *a*, Leaf, and *b*, flower-buds.

them. As there must be wood before there can be fruit, it is natural for a young tree to produce chiefly barren or leaf buds; but when the tree has attained a considerable size, it is more disposed to produce flower-buds, and

pruning becomes necessary in order that flower-buds may not too much predominate, for in that case a deficiency of young shoots would be the consequence.

Pruning and Training.—The Peach-tree requires what are termed winter-pruning and summer-pruning. The best time for performing the winter-pruning is January or February, before the flowers begin to open, if on outside walls; for trees under glass, the best time is as soon as the leaves fall. However, it may be done at any time between the fall of the leaf and the rising of the sap, provided there is not severe frost. Summer-pruning should be commenced as soon as the shoots begin to push, and is continued as may be found necessary during the growing season. Training may be done any time after the trees are pruned in autumn or winter, and before they get into active vegetation in spring. The summer-train-

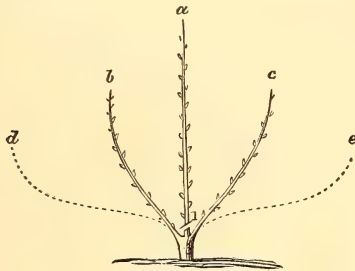


Fig. 973.—Peach. Training.

ing of the young shoots ought to be attended to throughout the growing season.

The Peach-tree is trained in a variety of ways, but the fan-method is the best; yet it requires particular care and some knowledge of the physiology of the tree, otherwise the latter will become weak at bottom and too strong at top, as well as exhibit irregular growth throughout.

Commencing with a maiden plant, consisting of a simple shoot from the bud, as at *a*, fig. 973, let that be cut back, as at 1, above two eligible buds, situated one on each side, and about 9 inches from the surface of the ground. Two shoots will likely push from these buds in the course of the summer, and they should be encouraged to grow as much as possible during the early part of the season by training them rather upright, as in the direction *bc*; but in August they should be lowered by degrees to the position *de*. They are thus brought nearly to a horizontal position, with the exceptions of their extremities, which are turned upwards in order still to encourage growth, and so long as they continue to grow

it matters not whether they are straight or otherwise, for they will be cut off at the winter-pruning.

The dotted lines, fig. 974, corresponding with those in fig. 973, represent the state of the tree, as regards its shoots, at the end of the first summer's growth, reckoning from the time when the maiden plant was headed back. At

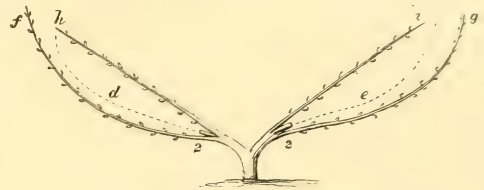


Fig. 974.—Peach. Training.

the ensuing winter-pruning, the shoots *de* are cut back, as at 2, fig. 974, and in the course of the summer four shoots, *f, g, h, i*, are the result. Here it should be observed that the extremities of the two lower branches *fg* are turned upwards during the growing season; whilst the two upper ones *hi* are not so favoured, otherwise, from being situated on the upper side, they would grow much stronger than the two lower branches, an occurrence which should be carefully guarded against.

We have now seen that by the first cutting of the plant it is divided into two branches; and that by the second cutting, performed twelve months afterwards, it is divided into four. At the third cutting, which takes place after the second summer's growth, each of the four shoots is shortened, as at 3, 3, 3, 3, fig. 975.

During the ensuing summer two shoots and a leader are trained from each of these branches, which eventually form the branches marked *b c f g m n q r*. The young shoots which are to form *f* and *g* should start almost close together

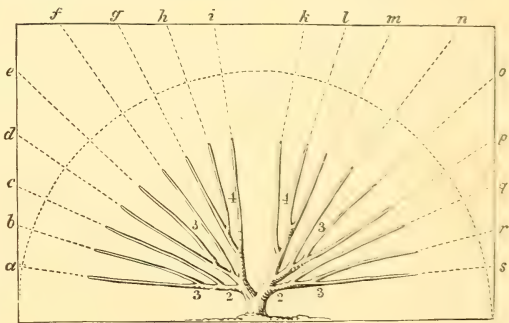


Fig. 975.—Peach. Training. ($\frac{1}{2}$ in. to 1 foot.)

from *a*, and the same applies to the corresponding branches on the other side of the tree. When the branches are trained in the following

season, the spaces between *d* and *f*, also between *p* and *n*, are widened so as to leave room for another branch on each side, *e o*. All young growths are shortened back to firm wood as before, and shoots are left when disbudding to form leaders, for bearing wood wherever there is room, for the two new branches, *e* and *o*, and for four more in the centre, *h i k l*. Thus at the end of the season there will be eighteen principal branches, which are to be trained as the dotted lines show. These will be quite sufficient to furnish the whole tree with bearing wood.

Many other modes of training are practised, but most of them are open to the objection of encouraging one or two leaders on each side which serve as bases for the other branches. In a properly-trained fan-shaped tree all the branches should be of equal strength, and disposed so as to divide the sap equally over all portions of the tree. They are also conveniently placed for removal should a branch die, as the others can be lowered to fill its place, and the centre refilled with young branches.

In training the Peach an equality of vigour amongst all the branches should be aimed at. The branches should be frequently examined in detail; a comparative inspection ought to be made of every three, of the lowest three with the next three, and so on; and again, every three on the one side with the three opposite on the other side. If one side of the tree is found to be weaker than the other, the branches of the weaker side should in general be elevated above their assigned position, and, on the contrary, three of the stronger side should be depressed. The latter ought also to be disbudded, and their summer-shoots nailed in before those on the weaker side of the tree; over-vigorous shoots should be checked at an early stage of their growth. All superfluous shoots ought to be cut away. Whilst a sufficient supply of shoots for succession must be encouraged, none beyond these should be allowed to exist, with the exception of those necessary for leaders. If, in the early part of the season, it is seen that a succession shoot will unquestionably become too strong, it should be stopped at an early stage of its growth.

With regard to the weak side, an opposite mode of proceeding should be adopted. Shoots not absolutely required for succession may very properly be allowed to grow. The succession shoots generally should be trained at full length, and where there is space, the shoots at the extre-

mities of the bearing shoots may also be left unshortened. If a few over-strong shoots should start on the weak side, they had better be checked; but all others on that side ought to be encouraged.

If the leaves on one side of the tree were equal in number to those on the other, then the amount of vigour would also be equal, provided the leaves on both sides were of the same average size and equally healthy. This is a fact which should be borne in mind; but in stating it we do not mean to imply that the leaves should be counted, or their dimensions calculated. In practice, a sufficiently correct estimate of the relative amount of foliage on both sides can be formed by looking at the foliage on branch *a*, fig. 975, then at that on the opposite branch *s*, and so on. Presuming that *a*, *b*, *c* and *d*, *e*, *f* are, according to their respective lengths, equally furnished with leaves, then the quantity of foliage borne by the first three, as compared with the three above them, will be nearly as 7 to 9; that being about the proportion which the united length of *a*, *b*, *c* bears to that of *d*, *e*, *f*. In that proportion, therefore, the increase of the base of the branches *d e* will exceed that of the base of *a*, *b*, *c*; and the consequence will be that the former must every year become so much stronger than the latter, instead of which it would be desirable that they should be of equal vigour and thickness. This condition would be obviated by not allowing the branches to extend beyond the semicircle *a s*, but then, on referring to the figure, it will be seen that a large portion of wall is left uncovered.

Supposing the trees to be planted 20 feet apart, and the wall to be 12 feet high, the space which a tree like that represented in the figure might occupy would be 240 square feet; but if limited within the semicircle, it would only cover 166 square feet, leaving 74 square feet, or nearly one-third of the space, unoccupied. Rather than this should be the case, it would be almost better to put up with the loss of the three lower branches on each side. But, in order to guard against this, something may be done; allowing the radius of the semicircle to be 10 feet, then the distance between the branches where they intersect the dotted arc line—that is to say, when they have extended 10 feet from the centre—will be very nearly 21 inches, which would be wider than necessary. To fill that space branches may be originated from the upper side of *a*, *b*, *c*, at about 5 feet from the stem. There will then be six branches

in connection with the base *a*, *b*, *c*, and they may be distributed over the space of wall from *a* to *d*, the latter being trained closer to *e*, so that between these two an intermediate branch may not be required; then, if *e* and *f* be subdivided, there will only be five branches in connection with the base *d*, *e*, *f*, instead of six, as in the case of the base *a*, *b*, *c*. This will give the latter considerable advantage; and, with the other means already detailed, an equality of vigour as regards the first two subdivisions of the tree may be maintained, whilst the symmetry of the whole is also preserved. What has been said of the branches on the one side of the tree applies, of course, to the corresponding ones on the other side.

With regard to the direction of the branches, it may be as well to point out how they may be laid off so as to present a regular appearance, without being too crowded in some places and too thin in others, as well as to prevent loss of time in rectifying errors which may easily be avoided in the beginning.

The system which has been detailed gives two principal branches, from near the base of each of which three branches are originated, and these are each subdivided into three; so that the leading branches of the tree consist of nine branches on each side, or eighteen in all. They form angles of about $9\frac{1}{2}^\circ$ with each other. Now, if they were laid off at this angle, like the radii of a semicircle, there would be nine branches on each side and one perpendicular in the centre—a position which, in fan-training, no principal branch should occupy, as it is then apt to grow too strong. It is therefore better to be without it, as in fig. 975, in which two spaces are left between *i* and *k*; then eight more branches bring us down to *a*, which is elevated 5° above the line passing horizontally through the central point, and this elevation is an advantage to the lower branches.

From the principal branches shoots for bearing should be allowed to proceed, and also for subsidiary branches, where space admits of such. In order to maintain a symmetrical tree, these smaller shoots and branches should start from the upper side of the main branches. In our climate, the extremities of the shoots do not usually become perfectly ripened, and this is one reason why they should generally be more or less shortened back. In doing this it is best to cut to a bud situated at the back of the branch, or nearly so, for if cut to one at either side, the young shoot forms a bend from where it proceeds, and if cut to a bud in front,

it curves outwards; but when cut to a bud on the side next the wall, the branch grows quite straight.

Pruning.—The directions for pruning the Peach-tree will be easily comprehended on reference to figs. 971 and 972. In fig. 972 the buds marked *a* are leaf-buds, and all the others flower-buds. In fig. 971 we have two single leaf-buds near the base of the shoot; then a twin-bud, consisting of a leaf-bud and a flower-bud; next a single leaf-bud; then a triple bud, composed of two flower-buds and a leaf-bud in the centre; then a single flower-bud; and, finally, two flower-buds, with a leaf-bud between them, above which the shoot is cut. It would be wrong to cut to the next lower joint, or immediately above the single flower-bud *a*, for that bud would not produce a shoot, and the branch would ultimately die back to the next leaf-bud. In fig. 972 there are only two leaf-buds; one, which forms the growing point or apex, situated in the midst of a cluster of flower-buds; the other near the base of the shoot. Therefore, in such cases, the shoot must either be left at all its length, or cut back above the leaf-bud at the base. The latter is generally the preferable mode, for a succession shoot would be obtained; whereas, if not so cut back, the whole would be naked in the following year, with the exception of a slight elongation of the growing point.

In the Peach-tree, all wood that is more than one year old serves only to support shoots that do or may bear fruit; but enough of main branches, and others subsidiary to them, should be provided for, in order that a sufficiency of bearing-shoots in every part of the tree may be ensured.

From what has been stated, it is presumed that the training of the main branches of the tree, and also the subsidiary ones, will be understood. The management of the bearing-shoots, and of those intended to form a succession to them, remains to be considered.

In fig. 976, *a* represents a portion of a branch before the winter-pruning; *b* and *c* are bearing shoots, which were shortened at the previous winter-pruning, bore fruit in the following summer, and also produced the shoots *d* and *e* for succession. The shoots *b* and *c* having once borne, will do so no more, and therefore

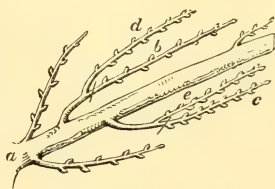


Fig. 976.—Peach. Pruning.

they are cut off close to the origin of the succession shoots *d* and *e*. These succession shoots, like their predecessors, are shortened at the winter-pruning, in order that, whilst they bear fruit in the ensuing season, they may also produce, in their turn, shoots for succession. In general, every bearing shoot throughout the tree should have a young shoot for succession, and the nearer the young shoot springs from the base of the bearing shoot the better. It may be encouraged from the side of the bearing shoot next the branch, as at *e*, or from the opposite side, as at *d*. This should be arranged when disbudding, so as to prevent the shoot from getting too far away from the main branch. If at any time a bud starts closer to the branch than where *d* and *e* originated, it should be encouraged, and the stub, which results from repeatedly shortening back to near the base of the bearing shoots, can then be reduced. In fact, wherever there is an opportunity of obtaining a succession shoot from the old branch, it should not be neglected, provided there is room for such young shoot.

Fig. 977 represents a branch with two shoots, one of which, *b*, is intended for succession, and



Fig. 977.—Peach. Pruning for Succession Shoot.

is pruned at *e*, whilst the shoot *a* is stopped at *c*, and at the next pruning is cut off at *d*. A number of other succession shoots may be allowed to grow to the length of 10 inches or 1 foot, and then be stopped. Several summer laterals will result; but they will push mostly just below where the shoot was stopped; whilst, lower down, enough of flower-buds will in most instances be formed. By these means the amount of foliage will be much less than would otherwise be the case.

Fig. 978 represents a branch with two shoots, one of which is pruned at *a*, whilst the other is cut close to the base at *c*, thus leaving the leaf-bud *b* to form a succession shoot.

From the foregoing it will be seen that the Peach must have a number of principal branches to constitute what may be termed the framework of the tree, and also subsidiary ones to

fill up as the others diverge; the rest consists of bearing shoots, and from or near the bases of these, succession ones. These should all be managed according to the general principle above explained, that is, the bearing shoot is

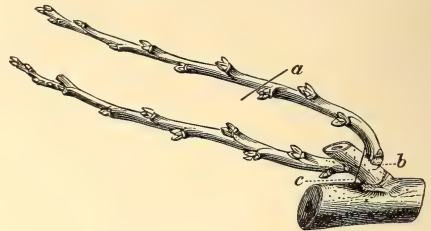


Fig. 978.—Peach. Pruning.

shortened, more or less, at the winter-pruning. This has the effect of inducing shoots to push from the buds on the part left, and the lowest of these shoots is to be selected to form a succession; for the bearing shoot, unless it be the leading shoot of a branch, must be cut away at the winter-pruning. From this it appears that the pruning and training of the Peach-tree, when it is once formed, is reduced to three very simple proceedings:—

1. Shortening the intended bearing shoot at the winter-pruning, if the tree is growing outside. For all indoor culture this shortening is rarely required, as the shoots get well ripened and may be laid in full length.

2. Training a succession one in summer.

3. The removal of the shoots that have borne fruit, except such of them as are leading shoots of branches.

The length to which the bearing shoots ought to be shortened depends on their vigour, and occasionally the position of leaf-buds; for in order to cut immediately above one of them, the shoot may have to be cut much shorter, or left at greater length than would otherwise be advisable.

The distance along the branches, from one bearing shoot to the other, may be 12 or 14 inches. On a branch that is weaker than it ought to be, more succession shoots should be encouraged than on the adjoining stronger ones, and more space should be allowed them, by training those from the stronger branch in a limited space; but all young branches of the previous year's growth, when trained in at the spring-pruning, should have a clear space between them of not less than 4 inches.

Stopping or Pinching.—This is in many respects the same as disbudding, and is practised during vegetation. Its object is to rectify any neglect which has been made with regard to the tree,

and keeping it in good condition. It accelerates the formation of flower-buds, and puts an end to all confusion with respect to the branches. If not done with judgment, stopping may produce the very opposite effects, hindering the formation of buds, or causing them to be developed before the proper time; but, when the

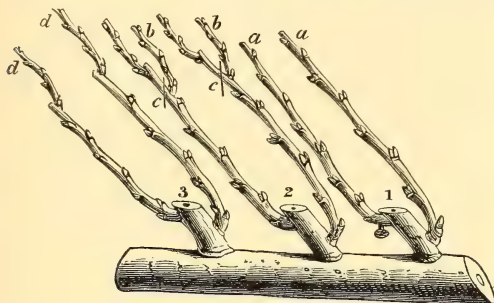


Fig. 979.—Peach. Stopping or Pinching.

operation is well done, it is one of the most useful in the art of developing trees.

Fig. 979 represents a branch, the shoots on which have been shortened. No. 1 shows two shoots which have been stopped above the eighth leaf, at *a a*. The flow of sap occasioned by this operation has had the effect of swelling the fruit, at the same time avoiding bursting the eyes made below. At the end of eight or ten days the two or three terminal eyes are developed as shown in No. 2; when these shoots have acquired sufficient length the second pinching is performed, which takes place on the lowest shoots *b, b*, a little above the fifth leaf; the two remaining shoots are pruned at *c c*. No. 3 shows the shoots after the last operation has been performed.

Fig. 980, *e*, gives an example of stopping where the fruit has not set. The upper branch *a* is cut back, as well as the lower branch *b*,

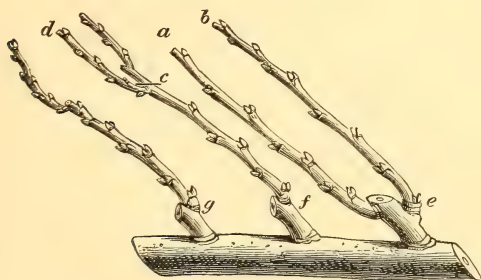


Fig. 980.—Peach. Stopping before the Fruit is set.

in order to give vent to the sap, and promote the growth of the eyes near the base, which ought to yield fruit; *f* shows the effects of the first stopping. Then the first shoot is cut back to *c*, and the second is stopped at *d*; *g* gives

the result of the second stopping, a feeble result, as the sap is not in full flow.

Fig. 981 represents a branch which has been pruned above the fifth bud from the base. In this example the pinching ought to be short because the sap is most divided. The terminal shoot has been pinched, and afterwards cut back to *a*, which has had the effect of causing the sap to flow back on fruit at the base. The two shoots *b* and *c* have been pinched twice, which has caused the fruit to swell and promoted the growth of the succession shoot *d*.

Disbudding.—This consists in the removal of buds, or rather shoots in a very young state. It is evident that if all the young shoots were allowed to grow, they would soon become excessively crowded; it is therefore necessary that all should be removed except those for which there is sufficient space. The operation ought to be commenced by the removal of those situated in front of the strongest branches, especially if these are in connection with branches

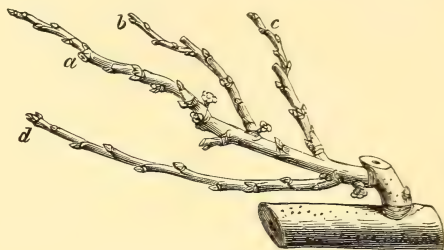


Fig. 981.—Peach. Stopping for Succession Shoot.

too strong for the others. Then in a day or two those in front of branches or shoots lower down should be removed, but care must be taken to preserve the lowest side shoots on each for succession. Those having fruit at their bases should also be left untouched.

The process of disbudding should be regulated according to the state of the weather, and consequently according to the greater or less activity of vegetation. If the weather proves ungenial, and vegetation is languid, it is not advisable to disbud much; if, on the contrary, the days and nights are warm, disbudding should be thorough. Vegetation may commence with a considerable degree of activity, but frequently cold weather ensues, and the slightly developed leaves linger or remain in a stationary condition. When they are in this state it is better to refrain from disbudding till vegetation again becomes active. Every bud that is being developed maintains a circulation of sap in its vicinity, but when a bud, or the young shoot resulting from it, is pinched or cut

off, the circulation depending upon it must cease or find other channels. In the former case stagnation of the fluids proves injurious to the general health of the tree; but if the sap readily finds other channels, the circulation undergoes little derangement.

When the young leaves are expanding slowly, in consequence of low temperature, we may remove from a shoot every pushing bud except one, and yet that one will scarcely be excited

any of the succession shoots appear likely to become too vigorous, their tops must be pinched off, but it would be desirable that this should be done not lower than 1 foot or 15 inches from the base.

After the fruit is gathered, all wood that is not required for the following year's fruiting, or for extending the size of the tree, must be removed, so as to give the shoots left the full benefit of the food supplied by the roots, and exposure to air and sunshine.

Thinning the Fruit.—To what extent thinning should be carried depends on the vigour of the tree and natural size of the fruit. If the tree is weakly, its fruit should be left thin as compared with that on a tree that is vigorous; and on weak branches fewer fruit should be left than on the more vigorous branches of the same tree. If the tree is in a healthy state, and the flow of sap distributed as equally as possible throughout the respective branches, the fruit will set in much greater abundance than could be properly matured, and few will drop unless injured by frost when in a young state. Large-fruited varieties, all other circumstances being the same,



Fig. 982.—Nectarine. Humboldt. (3.)

to a more rapid development. If we at once remove nine buds from a shoot, and leave only one, that one, under any circumstances, will not be prepared to receive the sap which was in movement towards the other nine. In order that the disbudded shoot may continue healthy, the disbudding should be performed by degrees. The forerights, in the first place, and then the others, should be gradually thinned away, till no more shoots and foliage are left than there is room to fully expose to light.

The leading young shoot of branches intended to be prolonged should be trained at full length. The terminal young shoot of bearing branches ought to be allowed to grow till its lower leaves are nearly full-sized, and then it should be shortened to 3 inches. Other young shoots having fruit at their bases should also be cut or pinched back to three or four leaves; and when the fruit is thinned, many of such shoots, from the bases of which the fruit is removed, may be dispensed with. It will sometimes happen that on shoots laid in for bearing there will be no fruit. When this is found to be the case, they may be cut off at the base, and the succession shoot trained in their place. When

require more thinning than those that are small. Nectarines, being generally smaller than such Peaches as the Noblesse, Barrington, &c., need not be so much thinned.

A large vigorous tree may be allowed to bear as many as twenty dozen fruits, and these, if the foliage is healthy, ought to be large and fine. Trees are sometimes allowed to bear almost as many fruits as they will; the consequence is that the trees are weakened in producing a great number of stones, but the quantity of flesh is by no means in proportion, whilst the quality is very inferior. The fruits, though numerous, are small, thin-fleshed, sour, and would be reckoned unfit for use by those accustomed to eat Peaches or Nectarines in perfection.

If there has been no frost to injure the kernels in spring the fruits may be pretty well thinned at once; but however healthy the tree may be, if the kernel is injured from the above-mentioned cause, the fruit is very liable to drop, and therefore it is necessary to leave a greater number till such time as the stone is formed. The first thinning should take place when the fruit is scarcely the size of a Hazel-nut. By that time it will be

seen that some of the fruits are larger than others. The smallest, of course, should be dispensed with. In removing the superfluous fruits care should be taken not to tear the bark off the shoots, as is likely to be the case if the fruit is pulled backwards towards the base of the shoot. The fruit should be a little twisted and pressed in the opposite direction, or it may be cut or clipped off. For medium-sized Peaches and Nectarines one fruit per square foot of trellis is quite enough, in order to secure perfection in size and quality. Small kinds, such as Alexander Peach and Elruge Nectarine, may be left 9 inches apart each way; large varieties, such as Sea Eagle and The Nectarine Peach, should be twice that distance apart.

Other Cultural Matters.—With regard to the routine culture during the summer, besides the operations of pruning and training, one of the most essential points to be attended to is the condition of the roots in respect to moisture. In one week the roots may have just enough moisture, and if the weather is hot the tree will make shoots and foliage with great rapidity; in the second week rain may not fall in sufficient quantity to get down to the roots, which have then to meet an increased demand from a diminished supply; and in the third week the tree exhibits symptoms of disease. The leaves droop and lose their healthy green hue; and although this appearance may have the effect of causing the watering tubs to be employed, yet when full-grown leaves have once been allowed to droop and assume a yellowish sickly tinge, they cannot again be brought to their former healthy condition, whilst the attacks of insects, induced by dryness, must also be taken into account.

It is much easier to keep a tree healthy than to restore it after it has been allowed to become sickly. Let the border therefore be frequently inspected to the depth of the roots. Whenever water is applied, give enough to thoroughly soak the soil to the full depth of the roots. If the crop is heavy and the fruit has stoned give weak liquid manure from the cow-yard, or give a moderate dressing first of Thomson's Vine Manure, forking it under the surface and putting some short litter over before watering with clear water. If necessary, let the soil be forked over in ridges, and let the hollows be filled and refilled with water till the border is thoroughly moistened to the bottom. When the top soil has dried, so as to be in working condition, it should be levelled, and if a good mulching of stable litter can be given, it will keep the

ground longer moist, and also assist the swelling of the fruit.

When the trees are kept in a proper condition as regards moisture at the root, less syringing will be necessary; nevertheless it is very beneficial. It is a good plan to syringe not only the trees, but the whole wall, with Gishurst Compound, 2 ozs. to the gallon of water; or a mixture of soft soap 12 ozs., tobacco juice $\frac{1}{2}$ pint, water 3 gallons, before the buds expand in the spring. If the weather is cold this should be done early in the day, so that the trees may get dry and escape getting frozen at night. Syringing should be discontinued after this until the blossoms fall, but after the fruit is set it should again be daily resorted to at about 4 p.m., using clear water.

By taking care that the soil about the roots is never allowed to become too dry, and by syringing the foliage, the ravages of red spider will be prevented; by first syringing them, and then dusting with snuff or powdered tobacco leaves, the green-fly will be annihilated. Attention to these matters will ensure healthy foliage, and consequently healthy shoots; and if these are properly managed, according to the directions given for pruning and training, well-grown trees and abundant crops will be obtained where the climate is at all favourable.

When the fruit approaches maturity, it should be exposed to the direct rays of the sun, by putting aside any leaves that shade it. By so doing the fruit becomes sooner and better ripened. In cold seasons and rather unfavourable situations this should be more especially attended to. If the foliage cannot be removed entire without weakening the tree, take away half of each leaf which obstructs the light. In the case of succession shoots, whole leaves should never be removed, as it destroys the buds at their base. When the fruit has almost reached its full size, a pad of cotton-wool should be used if it is likely to bruise against the branches.

Gathering the Fruit.—Instruments of a funnel shape, lined with velvet or other soft substance, have been recommended for gathering Peaches without handling them; but nothing is better than the hand, for with it the fruit can be grasped and pulled without touching the crown or part next the sun. The Peach should be taken in the hollow of the hand, and the softest parts of the thumb and all the fingers applied as much as possible behind the fruit. If the latter is perfectly ripe it will easily part from the tree; so easily, indeed, that when the whole pressure is divided among the parts brought in contact



Fig 983.—Peach Tree on Wall Outdoors. Shoots not yet nailed in.

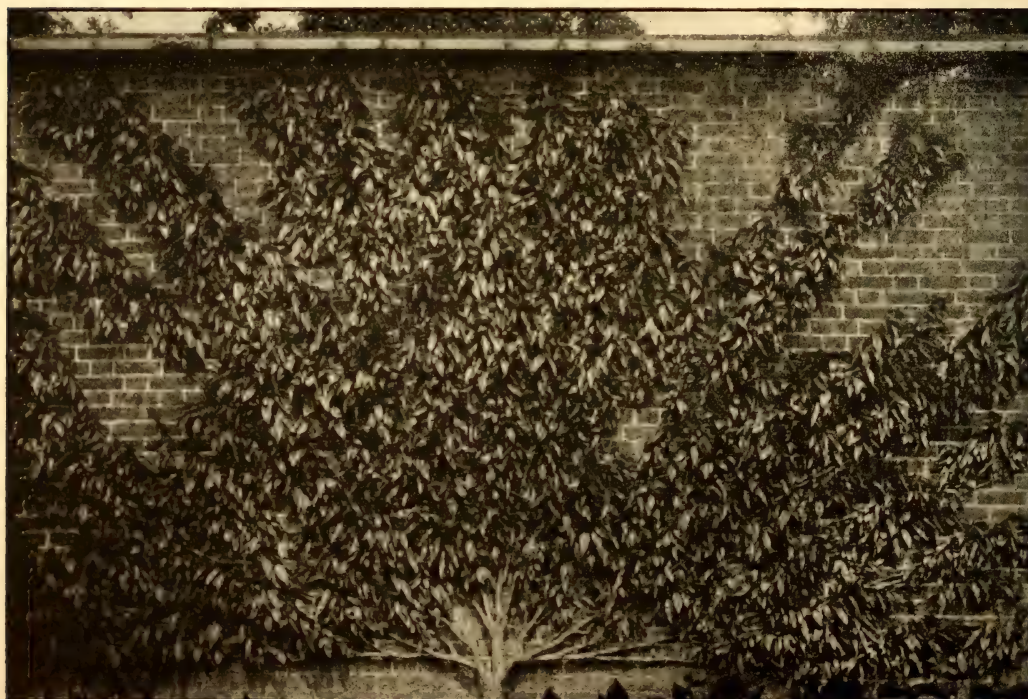


Fig. 984.—Peach Tree on Wall Outdoors. Shoots nailed in to expose Fruits.

with it, no place can be bruised. The fruit is often well coloured next the sun before it is ripe, the part next the wall being still green; but afterwards the green acquires a yellow tinge, by which the ripening can be known. Peaches may be gathered in the heat of the day without suffering any deterioration as regards flavour. They may be kept for a week or more after they are gathered by placing them in a cool, dry room or cellar. The flavour is easily spoiled if they are placed near anything with a strong smell, such as deal boards, damp hay, or moss. Clean paper shavings are best for laying them on.

Diseases.—If the Peach-tree is treated as we have recommended, it will generally be healthy. Under the best management, however, some trees will become diseased.

Gumming is the most to be dreaded, and is very difficult to cure; indeed, if it pervades the tree to any considerable extent, the sooner it is removed and replaced by a healthy one the better. If the symptoms are but slight, the bark should be frequently well washed with a brush and water; this ought to be done in moist weather. The disease is apt to occur when the trees are planted in soil too richly manured, and whenever strong shoots are allowed to grow as much as they will, and are then cut back. It is not well to use any manure below the surface when planting the tree, but if that has been done, and the tree is inclined to over-luxuriance, the greater care must be taken to divide the sap among the branches by judicious summer-pruning, so that there may be no large pieces to cut out at the winter-pruning. It is also advisable to lift the whole of the roots as soon as the foliage commences to decay in the autumn, preserving all the fibres possible, and pruning away any long straight pieces which are devoid of fibre, also all that strike downwards into the subsoil. See that the drainage is perfect before replanting; use fresh soil if the other has proved unsuitable (see "Soil", p. 167). Large wounds which are accidentally caused on the branches of Peach-trees are apt to cause trouble by gumming, and must be pared off evenly and covered over with Lefort's Mastic.

Mildew is also very destructive, but may be got rid of by means of flowers of sulphur, which should be applied on the first appearance of the disease. Indeed, it is a good plan to dust the trees over before mildew makes its appearance at all.

Blistered leaves are occasioned by cold, particularly when this occurs after a spell of

warm weather. The growth of the midrib is arrested, and the circulation of the sap being obstructed, the leaves, or part of them, become swollen inert masses. There is no cure. The preventive is, of course, warm covering. The leaves that are most affected should be taken off at once, if they can be spared without injuring the growth of the tree. If the disease is very prevalent remove only the worst, and leave the others until later.

Yellows is a disease little heard of, except in America, where it destroys whole orchards in a few years. It most often manifests itself in trees growing on the Peach stock, and consequently, in order to avoid it, they should be worked on the Plum or on the Almond (see also "Propagation", p. 188). One of the causes of this disease in this country is a cold and ungenial soil. It may exist a long time before it attracts attention. Its presence may be suspected on any diminution in the green colouring of the leaf, and should the border be properly drained and the soil warm and sweet, other causes must be sought, such as excessive root-pruning, deficiency of plant food, mildew or other disease, possibly occurring the previous season. Experiments made by Sachs some years ago proved that this disease is sometimes due to a deficiency of iron. This proved to be the case with a tree at Ketton Hall Gardens, as recorded in the *Gardeners' Chronicle* in 1889, as follows:—

"*Ferrous Sulphate for Chlorosis or 'Yellows'.*—I have tried this remedy as recommended by you in remarks on Sachs' experiments by Professor Marshall Ward, and am very much pleased with the result. Owing to the drainage being badly laid when one of our Peach houses was built, I found it necessary to lift a number of large old trees in November, 1887, and put in fresh drainage. One of these trees was a Princess of Wales Peach, which was severely checked and weakened by being lifted, and early this spring it was badly affected with chlorosis or 'yellows'. I accordingly removed the soil, about 1 foot in depth immediately over its roots, and dissolved $\frac{3}{4}$ lb. of sulphate of iron (green vitriol) in water, at the rate of $\frac{3}{4}$ oz. to 5 pints of warm water. This was poured over the roots, and washed in with a plentiful supply of clean water whilst the soil was moist. The surface soil was then replaced, and in about a fortnight the tree had improved considerably, and is now quite healthy." This tree was still alive and healthy in 1894.

Sun-burning.—The bark of Peach-trees becomes scorched in consequence of exposure to

hot sunshine, which has most effect on the stem and thick naked branches; to guard against ill effects arising from this cause, the former should be protected with tiles, slates, or any other suitable material, the latter by training some of the young shoots over them.

PEACH CULTURE UNDER GLASS.

With the exception of the Grape-vine no kind of fruit-trees have been so generally grown under glass in this country as the Peach and Nectarine. In the northern parts of the kingdom the fruit



Fig. 985.—Nectarine. *Violette Hative*. (S.)

cannot be brought to full perfection on the open wall, but under glass, with more or less artificial heat, according to the climate and period of the season, fruit both large and excellent can be obtained in the extreme north. The tree requires a good soil, maintained in a proper state as regards moisture, abundance of light, that of the solar rays as direct as circumstances will permit, and a full command of heat sufficient for the growth of the trees and maturation of the fruit, even when the house is not closely shut up. A free circulation of air is essential for dispelling the moisture, which would otherwise lodge too long upon the foliage, or upon the blossoms and the fruit; for although the foliage must be washed, and the air of the house rendered moist at times, yet a moist stagnant atmosphere is injurious.

The border in which the trees are intended to be planted should be well drained, as already detailed under Open-air Culture (p. 167), and care must be taken that by no possibility the roots can come in contact with water percolating

through the substratum, or stagnant there. If a test-hole were dug to the depth of 3 or 4 feet from the surface, and if in this water should stand for some weeks at any period of the season, then means must be adopted to prevent the roots from ever going down so far. Draining is the best, provided there be enough of fall; if not, concrete or paving ought to be resorted to, if the expense can be afforded. If the bottom of the whole border cannot be concreted or paved, a portion may be done below, and to some distance from the place where the tree is planted, to prevent at all events tap-roots from forming; and if this be done, the horizontal roots can always be enticed to the surface.

In the case of bad subsoils it is safest to build Peach and other forcing houses on a terrace. The bottom having been put in a satisfactory condition, the soil may be laid on to a depth of not less than $2\frac{1}{2}$ feet, a mass of this thickness retaining a steadier supply of moisture than a shallow border.

The soil ought to consist of good mellow turfy loam, which is substantial but not of a binding nature. If the loam is rich, manure will not be required in the first instance. If the soil is rather strong and adhesive, add mortar rubbish and burnt earth (see p. 168), and some $\frac{1}{2}$ -inch bone manure will afford a supply of nourishment even after the trees come into bearing,

when of course they require it more than at first. For very early forcing the border should be made so that the roots will be inside, and consequently not be liable to be chilled by cold rains or melted snow.

The choice of trees partly depends on the position which they are intended to occupy in the structure. The best mode is to plant dwarfs in front, and train on wires from 12 to 15 inches below the glass. In order that forced Peaches and Nectarines may be well flavoured they must not be grown far from the glass. Some train dwarfs planted in front of the house on trellises, curved so as not to intercept the sun's rays from the trees which are trained against the back wall. We have known trees which were trained on a trellis at a considerable distance from the glass; but they did not yield good crops till their branches were raised and trained near the glass; excellent crops were then obtained. It is not the greatest quantity of shoots and foliage that can possibly be grown under a certain extent of glass that should be



Fig. 986.—Peach Case, Royal Gardens, Frogmore.



Fig. 987.—Specimen Tree of Downton Nectarine under Glass, Royal Gardens, Frogmore.

the aim, but the greatest amount that the sun can shine upon with the fullest effect.

We may suppose that the roof of a forcing-house is composed of one entire sheet of bright glass, and that between this and the floor a medium of ground glass is to be interposed where it will transmit the greatest quantity of light. To do this it must be placed where

If curved trellis work were constructed there would be a greater surface for training, but the amount of the action of the light on the foliage would on the whole be diminished. A distance of from 12 to 15 inches, as already stated, between roof and trellis, answers very well; farther would prove disadvantageous so far as light is concerned, indeed a less distance would be preferable in that respect; but, on the other hand, vegetation would be injuriously affected in severe weather if brought into closer proximity to the cold glass.

Fig. 988 shows the form of house for early forcing. Succession houses may be span-roofed, or if lean-to houses are preferred they should be built with flatter roofs than the above, in order that they may be cooler when the fruit is ripening.

The trees may be planted young, or they may be trained for several years, but in this case they should be taken up and replanted every second year. Their training ought to be conducted with a view to the position they are intended to occupy. They should be treated as directed for fan-

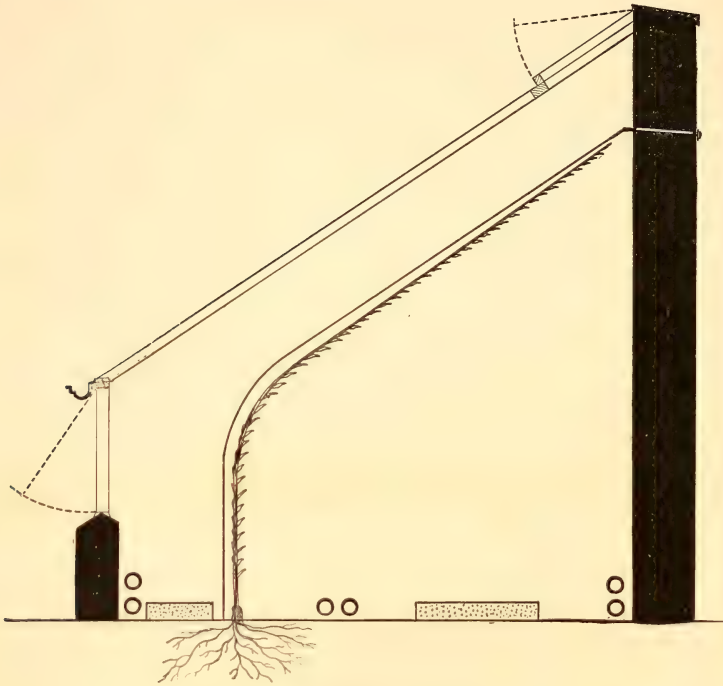


Fig. 988.—Early Peach House. Scale $\frac{1}{2}$ in. to 1 foot.

the light or the sun's rays can act through the sheet of glass with the greatest intensity. It must, then, be placed so as to form a plane near to and parallel with the plane of bright glass. The medium of ground glass might be waved to curve away from the glass roof like the circular front trellises which some recommend for the Peach; and having receded considerably, it might then curve upwards to the top of the back wall. This curving would require a much greater surface of ground glass than a plane running parallel to the roof; but the light below would be considerably less in the former than in the latter case, because the light after passing through the bright medium would act with diminished intensity on the portion of ground glass situated at a distance from it. If we take a lens and hold it near the glass of a forcing-house when the sun is shining, touch-paper will be readily ignited; but it will not be so if the lens is held at a distance from the glass.

training in respect to starting the branches. The length of the stem must depend on the height of the trellis from the ground at the place where the trees are to be planted. The stem should be cut over so as to subdivide at the base of the trellis. The branches ought to be trained with an inclination equal to the angle of the roof. By attending to this a tree may be reared to a bearing state before it is introduced under glass.

The late Mr. Errington, one of the most skilful gardeners in the country, selected the largest, cleanest, and best formed tree on the open wall, where it covered 480 square feet, removed it to a Peach-house, of course with due care, and the tree ripened in the same year about eight dozen of very good fruits. In the succeeding seven years it produced at least 2300 large and fine fruit. Specimens of the fruit we have frequently had the opportunity of seeing, and certainly they were remarkably fine. This is sufficient proof that

trees of considerable size may be introduced into a Peach-house. The best time for planting is after the leaves have fallen in autumn, but it may be done any time in November or December, but not later than January, unless in cases of necessity. Removal after the sap is in active flow is injurious.

The pruning of the tree should be conducted on the same principles as those explained for the Peach-tree on the open wall. If the summer-pruning is properly attended to very little wood will remain to be taken away in the winter; but as soon as the leaves fall all the trees under glass must be carefully examined, and any superfluous wood removed. Trees that have been badly pruned in previous years must have a thorough overhauling, but no large branches should be cut away unless absolutely necessary, as the Peach and Nectarine will not stand severe pruning, nor do they break readily from the thick branches if headed back. When pruning is finished, all young bearing shoots ought to be 4 inches apart throughout their whole length. It is not advisable to shorten the young shoots of trees growing under glass if they have ripened to their full length, except in the case of young trees to make them break more regularly. Strong shoots, if not thoroughly ripened, should be removed entirely.

If ripe Peaches are required by the middle of May, the variety being Royal George, or one ripening naturally at the same season, the trees ought to shed their leaves during the second or third week in October at the latest; but if they do not fall so early, it is better to start forcing with a few of them still hanging than to strip them off before they fall naturally, as that would weaken the flowers for the ensuing season. The house should be closed at night after the middle of November, but no fire-heat should be used if the weather is mild. Plenty of air should be given by day, the object being to get the trees to start very gradually, or the buds will drop without expanding at this season of the year. After the house has been closed at night for a fortnight fire-heat may be applied every night, less air being given during the daytime. The pipes should be only slightly warmed at first, or the air of the house will be dried too much, and the trees excited. A minimum temperature of 45° is quite sufficient, but this must depend on the outside temperature, which occasionally does not fall so low as this during December; then the night temperature may stand at 50° or 55° , with a chink of top

air on. The trees should have a light syringing when the air is dry, though the frequency of this will depend very much on the state of the weather outside. A little sun-heat should be closed in early in the afternoon if possible.

In summer, care must be taken to maintain as far as possible an equal distribution of the sap, by checking over-luxuriant shoots in good time, and encouraging those that are weak, by the means pointed out in the articles on pruning and training. As soon as pruning is finished, the whole of the glass and wood-work should be thoroughly cleaned with hot water and soft soap, scrubbing out all corners where insects may have found a retreat. After this the trees must be cleaned with soft soap or Gishurst Compound, using 4 ozs. to the gallon of water. Scrub all the old branches thoroughly, as the large brown scale may often be found on them, and if left undisturbed, will rapidly increase the following season. The young wood for next year's fruiting must be carefully sponged so as not to injure the buds, moving the sponge upwards from the base to the summit. All walls must be lime-washed. The surface-soil of the border should be removed to the depth of an inch, and replaced with fresh, sweet loam. The house will then be ready for starting when required.

Fire-heat must be very sparingly applied whilst the blossom-buds are swelling, whilst the flowers are expanding, and until the fruit is set. At the period when the Peach is in flower on the open wall the nights are usually cold, but if not so severe as to freeze the blossoms, the fruit sets very well. Mr. Errington's tree, above mentioned, was sometimes exposed to a temperature of 34° at night, when the young fruit were as large as marbles, without injury.

There is less danger to be apprehended from a low temperature during the blossoming period, provided it is not so low as freezing, than from a high one. The latter has often caused the total loss of a crop, the blossoms dropping prematurely after the house has been kept close and too warm by fire-heat at night. It is not, however, absolutely necessary that the temperature should be so low as 34° , although that will not do harm, except in retarding the process. As time is an important object in forcing, it is desirable, where fuel can be afforded, that as much heat be applied as can be done with perfect safety, both as regards the health of the tree and the security of the crop. It has been proved that 50° is a safe

temperature while flowering, and we would therefore recommend it.

Through the day the temperature may be allowed to rise by sun-heat to 60° or 65°, with plenty of air; but any sudden influx of cold air causing a lowering of the thermometer should be avoided. Air must be given to prevent the

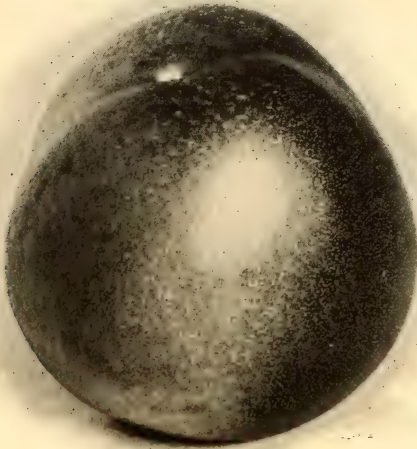


Fig. 989.—Nectarine. Spenser. (1.)

temperature from rising excessively, but not so as to lower it after it has reached too high a point. Independent of sun-heat the range of temperature between the minimum at night, and maximum by day, may be 5°. For example, if at a certain stage of growth (as when the trees are in flower) the maximum temperature with sun-heat in January is 65°, and the minimum temperature at night is 50°, a little air should be given at the top when the thermometer rises to 53°, to be increased when it has risen 5° more, and a chink of front air should be put on when it reaches 60°, and increased afterwards if the temperature is likely to rise above 65°.

After the blossoms drop, the condition of the expanding foliage should be watched, and if it be tender compared with that in a similar stage on Peach-trees on the open wall, less heat and more air must be given, till by a slower growth the proper firmness of texture is produced.

When the young fruit are the size of small marbles the heat may be gradually increased to 60° at night, and 65° by day or 70° by sun-heat. After the fruit is stoned the temperature may be raised to 65° minimum, 70° fire-heat on dull days, and 80° or 85° by sun-heat. When

the fruit has stoned, a high temperature can be safely allowed, provided the trees are duly supplied with moisture, and are in a vigorous healthy condition.

A good washing occasionally with water from a hose-pipe, judiciously applied before closing the house in the afternoon, is the best means of keeping the trees healthy and free from red spider and other insects. Fire-heat ought to be applied early, so as to keep the house above 70° until 10 p.m., allowing it to fall to 65° by morning. If insects are troublesome the trees should also have a good syringing before 7 a.m., applying the water with sufficient force to penetrate behind the branches. Care must be used not to get the surface of the border soddened, and thereby to exclude air from the roots, or the fruit will not swell evenly. The border will require water at intervals of two to three weeks, and must have enough each time to give it a thorough soaking. After stoning is complete, weak liquid manure may be applied with great advantage; when the fruit is about half-grown, and commences to colour, more water will be required.

Air must be admitted cautiously during windy weather so as to avoid cold draughts, which favour the attacks of mildew and aphid.

When the fruit commences to ripen, a little air should be left on throughout the night; this will greatly improve their flavour; syringing must now be discontinued until all the fruit is gathered.

The fruit must be kept exposed to the sun and light by removing all growths which are not required for furnishing the tree, tying the others to the trellis whenever it is required. The sun will not burn the fruits of Peaches under glass in this country, if they are kept fully exposed during the whole of their growth, and the structure is properly ventilated. Some kinds of Nectarines, however, are apt to be damaged on exceptionally bright days, as they are more tender in the skin, and have not a downy coat like the Peach to protect them. Lord Napier is especially liable to damage from this cause; a light shading of tiffany is therefore advisable on very bright days when it is ripening. Syringing should also be discontinued earlier with this variety, especially in the morning, as that is the time when the sun is most likely to scald the fruits.

Before the fruit is half-grown, and soon after stoning is completed, the trees should be carefully looked over to see that no more fruit is

left on than can be properly ripened (see p. 176); they must also be exposed to the sun as much as possible by wedging up all that have fallen on their sides, taking away leaves or parts of leaves from those on the top of the trellis, and doing all that is possible to afford the maximum of sunshine to every fruit. This will require periodical attention until the fruit commences to get soft and syringing is discontinued.

Directions for gathering the fruit are given on p. 177. The summer pruning should be done as soon as possible after the fruit is gathered.

Water will now be required less frequently than when the fruit was swelling fast, but at no period of the year should the roots be allowed to get dry. Inattention to this point is the cause of many cases of bud-dropping in the spring. Little else remains to be done before the leaves fall beyond giving abundance of air day and night. Red spider and other insects must be watched for, and dealt with as directed. A few lateral growths will also start away, and must be cut back to the first leaf, or they will rob the bearing wood for the next season.

Manures.—Peach and Nectarine trees planted out under glass are apt to grow too strongly after a few years, producing gross shoots which do not ripen, and therefore fail to form flower-buds; or those which are formed are not properly matured, and they drop in the spring instead of opening. This state of affairs is sometimes caused by too liberal feeding, especially if manures rich in nitrogen are used; the only time during the life of the Peach-tree when an application of nitrogenous manure is beneficial occurs after stoning is completed, and only then if the tree has a full crop of fruit. A quick manure, such as nitrate of soda, is therefore required, or drainage from the farm-yard. If the former is applied, phosphoric acid and potash must be given at the same time, or a strong leaf growth will be induced to the disadvantage of the fruit.

Thomson's Vine Manure, if used with discretion, is very safe and effectual for Peaches and Nectarines. The whole question of manuring, however, depends very much on the nature of the soil in which the trees are growing. A poor stony soil, when the crop is good, should be liberally fed during the period above-mentioned; so also should trees growing in pots and tubs. A light mulching of short litter is of great service to trees in borders during hot weather, both under glass and outside; but if the trees are growing freely this mulching must

not be of rich manure, and whatever is applied should be removed as soon as the fruit is gathered, when all feeding with liquid and other manures must be discontinued.

Treatment during the Resting Period.—While the wood is maturing, and after the leaves fall, the houses must be well ventilated. Cold will not hurt the trees if they are dry and the wood is well ripened. A close atmosphere must always be avoided, even if it is cold, as it will cause the buds to fall; air must therefore be given every day. If fire-heat is applied to keep frost from other things that may be in the house, the night temperature should be kept below 40°. Care is necessary in such cases to ensure that the borders are never dry near the roots of the trees. Water is not required so abundantly as when the trees are in active growth, but enough must be given to thoroughly soak the border whenever it is applied.

Pot Culture.—Peach and Nectarine trees may also be cultivated in tubs or pots under glass, either alone or mixed with other fruits, and, by a judicious selection of varieties, a supply may be had lasting for six months.

The form of tree best adapted for this purpose is the pyramid (fig. 990). For large houses the half-standard form is sometimes preferred (fig. 991). Early Alexander and its near allies are difficult to keep in pyramid form owing to their shyness in forming wood-buds.



Fig. 990.—Pyramid Peach. Early York.

Many of the leading nurserymen now grow and train trees specially for pot culture, and by purchasing trees two or three years old much time is saved; but they may easily be trained from maidens by cutting them back to one stem with five or six good buds, training the uppermost shoot for a leader, and stopping the horizontal branches when 9 inches long to

strengthen the back buds, continuing this yearly until the desired size is reached. Growth may then to a certain extent be reduced by confining the roots to the same pot for several seasons,



Fig. 991.—Half-standard Peach. Alexandra Noblesse.

and pruning back the young shoots each autumn to the third or fourth bud from the base.

Repotting.—This should be done when the leaves turn yellow, shaking the old soil away as much as possible without injuring the principal roots. Remove all suckers and root-buds. Many of the young fibrous roots may be taken away from pot trees in the autumn without any danger of injuring the next season's crop of fruit. In repotting, drain thoroughly, and put a handful of soot over the crocks to keep out worms, which often do much damage in the growing season; Porter's patent crocks are very useful for this purpose. Care must be taken that the old ball is not replaced in the pots in a dry condition; if there is any doubt about it soak it well in a tub of water for fifteen minutes. The soil used should consist of good turfy loam, with the addition of one-twelfth chalk or lime-rubble broken and put through a $\frac{1}{2}$ -inch sieve. Pot very firmly, and leave a space of inches below the rim for water and top-dressing.

Storing the Plants for the Winter.—One advantage of pot culture is that the plants may be removed elsewhere and the house used for other purposes during the winter; but wherever the trees are placed, they must be protected from severe frost, which would crack the pots. It

would not hurt the trees if they were dry overhead. They require to be cool—below 40° if the outside temperature permits; they must also be well ventilated, and if these conditions are fulfilled it does not matter if they are kept in a dark shed. A sudden rise of temperature must be carefully guarded against, as it would excite the buds and cause them to start into growth prematurely, with subsequent loss through their falling off instead of expanding their flowers. They must not be allowed to get dry at the root; at the same time they do not require so much water as when in active growth. Should the roots get frozen they will take no harm, but they should be allowed to thaw gradually.

The Flowering Period.—If the trees are to be grown without fire-heat, the plants should be arranged in their places by the first week of February. When the flowers commence to open, which will be a fortnight later, the house should be fumigated on two successive evenings to destroy insects. After the flowers commence to expand, abundance of air must be given on every favourable occasion, and a small quantity should remain on at all times if the weather is mild. Keep the temperatures at all times as near as is possible to those recommended for Peaches grown in borders under glass, and proceed to thin the fruits when they are set after the same manner. Owing to the limited space in which pot trees have to grow they must not be cropped heavily, or the fruits will be small and deficient in flavour. Four to six fruits are sufficient for a tree in a 9-inch pot. Those in tubs or pots 20 inches in diameter will mature from twenty to twenty-five fruits.

Disbudding and Stopping will require attention during active growth, as recommended for fan-trained trees, allowing for the change of shape in the tree, also for the fact that trees in pots do not grow so freely as those planted in borders, and therefore form short natural spurs without any assistance.

Top-dressing.—When the fruits are an inch in diameter the trees should have a top-dressing of manure to compensate in some measure for the limited root space available. Horse manure is very suitable for this purpose, as it is favourable to root growth. It should be collected when fresh from the stable, the straw removed, and then turned every second day for a week. About one-third part of turfy loam chopped small should be added to it before the first turning, and if some kiln-dust from the malt house (not malt culms) is added also, and some

liquid manure thrown on at each turning, the mixture will be improved. It should not be thrown into a large heap or it will heat violently. Great care is necessary in applying this manure, as it sometimes burns the roots if not well mixed and sweetened beforehand. It is, however, very valuable if properly used. The concentrated manures sold in the trade are also valuable for pot-trees if the above mixture cannot be obtained.

After top-dressing the trees with this they must be very carefully watered, as the state of the roots beneath the manure is not so easily



Fig. 992.—Peach in a Perforated Pot.

ascertained. In bright sunny weather pot-fruit trees often require water three or four times per day when in active growth. Sometimes this may be modified by using perforated pots, and plunging them in the borders (fig. 992). The borders in which they are plunged must be porous and properly drained, and be occasionally watered near the pots; a mulching of manure will prove beneficial after the roots have taken possession of the border and the fruit is swelling. Trees thus grown must be lifted in the autumn and their outside roots cut off close to the pots after the fruit is

gathered and the leaves have turned yellow. The surface soil should also be removed to the depth of 3 or 4 inches; this will destroy many surface roots, but that is of no consequence, as others soon form again in the spring. If the drainage of the pots is perfect the trees will need repotting every other year, top-dressing them only in the alternate year. After the foliage is off, the trees and house will require cleaning in the same way as recommended for fan-trained trees, see p. 183.

A list of suitable varieties is given on p. 194.

Packing. Peaches and Nectarines require careful packing in order that they may not be bruised. Lightness of hand is a great desideratum, as every pressed finger mark will turn black in a few hours. The early varieties of Peaches, such as Early Beatrice, Early Louise, Alexander, and others with very thin skins, which are easily rubbed off when ripe, are the worst. The fruits should be gathered while they are firm if they are to be packed, and must be timed to reach their destination before they are over-ripe. Market salesmen are particular about receiving them while they are hard, so that they will bear handling without injury.

Boxes must be made to hold one layer of fruit only, with a little packing material above and beneath. A convenient size is 18" × 12" × 3" for medium-sized fruit; for larger varieties they should be 4 inches deep.

The best packing material is the improved white wood wool, which is soft, odourless, and not liable to get damp after a few days' use, which wadding does. Each fruit ought first to be wrapped in tissue paper, just wide enough to cover two-thirds of the side and fold under the bottom, leaving the top of the fruit exposed; it may then be placed in the box, which has previously had a thin layer of wood wool spread over the bottom. More of this material must be placed round each fruit, so that it does not touch the sides of the box or any of its neighbours. Pack closely together, so that no movement can take place afterwards, and fill up all odd spaces with more wood wool. Place a layer of tissue-paper over the fruits, and enough wood wool to fill up to the lid. The latter must not be nailed, but tied with stout twine. If several boxes can be sent in one package, they travel much better than if sent singly. Paper shavings are preferred by some for packing Peaches. Moss, when dry, is also very good for the purpose; it should first be well beaten and sifted to remove all dust and dirt: if not thoroughly dry when used it will spoil the

flavour of the fruit. Bran, sawdust, hay, straw, chaff, and all similar substances, are not suitable for packing fruits of this character.

PROPAGATION.

The Peach and Nectarine are propagated from seeds, by budding, and sometimes by grafting.

Propagation from seeds is the mode employed for new varieties, for continuing some of the old ones, occasionally with little variation, and for stocks. The method of raising plants from the stones has already been adverted to in the chapter on propagation. The plants will frequently be fit for budding in the same season, much depending on circumstances of soil and climate, whether natural or artificial, with which they may be favoured. Downing states that, in America, a stone planted in autumn will vegetate in the ensuing spring, and grow 3 or 4 feet high, and may be budded in August or September. The stones may also be placed in pots, vegetated and forwarded in gentle heat during the spring, and encouraged by shifting, till the weather becomes warm enough to admit of the plants being turned out in the open air. It is occasionally very convenient to have some young plants of seedling Peaches for the purpose of budding with any scarce variety that might fail on the Almond or Plum stock.

The Peach stock is of course the most natural, but experience has proved that, in the soil of countries much farther to the north than that of its native country, the tree does not long succeed on its own roots. "At all events, the leaves, after several years, acquire partial tinges of yellow; and this goes on every year increasing, whilst the leaves are annually produced narrower and narrower, till at last the tree becomes useless. Peach-trees received by the Royal Horticultural Society from America were generally on the Peach stock, and all those that were so invariably became affected in the same way. George the Fourth Peach was one of the best of them. In a series of seasons it extended 35 feet along the wall, but being on the Peach stock, its foliage became so narrow and yellow that it was found necessary to remove the tree. The same variety has a healthy green foliage on the Plum stock."

Except in parts of the world where the soil is never too cold, the Peach stock ought not to be used.

The stock next in order, as regards natural adaptation for the Peach, is the Almond, which is very nearly allied to it. Of this, as a stock,

the French have had long experience, and the sort they prefer is the hard-shelled sweet Almond (*Amandier doux à coque dure*). All the varieties of the Peach take readily on the Almond; they also succeed well upon it in soils that are not cold and wet. Some varieties that do not take well on the kinds of Plum stock usually employed, had better be worked on the Almond for cultivation in the southern parts of the kingdom, whenever proper fruit-tree borders have been formed.

Plum stocks are generally employed in this country for Peaches and Nectarines. Hardy and almost wild varieties, called the Mussel, from the form of the fruit, and the Brompton Plum, are those most used for this purpose in the nurseries. It is found that all varieties do not succeed equally well on both these stocks. The Mussel is the stronger grower, and is the best for those kinds that take well on it. The Brompton Plum is employed for those which nurserymen term French Peaches, but this is a distinction not very definite. Although many of the finer kinds of Peaches take more readily on this stock than on any other, yet it has afterwards the disadvantage of not increasing in thickness in a corresponding degree with the Peach worked upon it. We have seen the Peach stem twice the thickness of the stock of this sort on which it was growing. The obstruction to the flow of sap which this disparity occasions tends to throw the tree into a bearing state, but weakness soon ensues, and the trees die off sooner than on stocks which afford a freer circulation of the sap. The French employ the varieties called the Saint-Julien, the Damas Noir, and Myrobolan. M. Lepère of Montreuil states, that the preference is to be given to the Damas Noir or Black Damask, which the cultivators near Paris get from Fontenay-aux-Roses; that they are cut down nearly to the level of the ground on planting, which is best done in November, and that they are budded when they have made fresh shoots fit for being worked at the proper season. We have seen trees worked upon the Saint-Julien growing so perfectly in accordance with the stock, that, even after a number of years, scarcely any inequality could be detected at their junction. It is stated that Peaches and Nectarines succeed well when budded on the White Magnum Bonum Plum.

The Peach and Nectarine may also be grafted, if care is taken to select for scions shoots with firm short-jointed wood, and with about 1 inch of two-year-old wood at the lower end. Such

should be taken off early in spring, and kept with their ends in moist sand till the grafting season arrives, that is, as soon as the sap of tree or stock begins to move. When worked, the successful taking of the grafts is promoted by earthing up to the top of the clay.

Mr. Cameron practised, when at Highbeach, Essex, the following mode of grafting. He says: "Sow in autumn kernels of Peaches, Nectarines, or Apricots, under the walls where they are to remain. Each will make a vigorous shoot the following spring, and this may either be budded in August of the same year, or grafted in March of the year following. Grafting is the mode I prefer, and the scion should have $\frac{1}{4}$ inch of two-year-old wood at its lower extremity; at least, I have found scions so taken off succeed better than those taken indifferently from any part of the young wood. Cut the stock with a dove-tail notch for the scion to rest on, and tie it on in the usual manner. Remove the buds of the scion in back and front, leaving two on each side and a leader; when these have grown 6 or 8 inches, pinch off their extremities with the finger and thumb, by which means each shoot will throw out two others, and thus produce in autumn a fan-shaped tree with ten branches. I have generally found them bear two or three fruit the second year from the graft, and a proportionally greater number the third year."

Mildew is very destructive to Peaches on open walls in some seasons, especially with Royal George and some other tender varieties. It is most likely to appear if the trees have got into a weak state of health, through any sudden check, or from the roots descending into a cold subsoil. The best remedy is Gishurst Compound, 2 ozs. to the gallon of water, applied during a fine afternoon. This must not be applied when the fruit is approaching maturity or it will affect the flavour. This disease is very troublesome when it once gains a start, and needs persistent attention until it is overcome. If Gishurst cannot be used, the foliage should be slightly damped, and dry flowers of sulphur applied with a sulphur distributor. Under glass its appearance is a sure sign of wrong treatment; usually a low temperature, deficient ventilation, or both. The best remedy here is to paint the pipes with sulphur, mixed with water, and a little lime to make it stick; keep the trees and house dry, and after the house is closed for the day make the pipes as hot as possible. This should be done on two or three successive nights.

Insects, &c.—See chapter on this subject.
Bark Enemies.—Peach Scale, Woëberian Tortrix. *Fruit and Seed Enemies*.—Ants, Birds, Earwigs, Wasps. *Leaf Enemies*.—Almond Aphis, Figure-of-8 Moth, Garden Chafer, Peach Aphis, Red-legged Garden Weevil, Thrips, Red Spider. *Root Enemies*.—Cockchafer.

The varieties of the Peach are difficult to distinguish from the appearance of the fruit alone. The following arrangement is founded on the fruit having either melting flesh which parts readily from the stone, or firm flesh clinging to the stone; the leaves being serrated, without glands, or having either globose or reniform glands at their base; and the flowers being either large or small. By these characters nine sections are here formed.

CLASS I.—MELTING PEACHES.

Flesh parting from the stone.

Division 1.—*Leaves serrate, glandless.*

Subdivision 1.—Flowers large.	Subdivision 2.—Flowers small.
Goshawk.	Dymond.
Noblesse.	Royal George.
Rivers' Early York.	
Malta.	

Division 2.—*Leaves serrate, with globose glands.*

Flowers small.

Crawford's Early.

Division 3.—*Leaves crenate, with globose glands.*

Subdivision 1.—Flowers large.	Subdivision 2.—Flowers small.
A'bec.	Bellegarde.
Alexandra Noblesse.	Crimson Galande.
Barrington.	Late Admirable.
Belle Bauce.	Stirling Castle.
Early Grosse Mignonne.	Violette Hâtive.
Hales' Early.	Walburton Admirable.
Princess of Wales.	
Sea Eagle.	

Division 4.—*Leaves crenate, with reniform glands.*

Subdivision 1.—Flowers large.	Subdivision 2.—Flowers small.
Dr. Hogg.	Dagmar.
Early Beatrice.	Early Alfred.
The Nectarine Peach.	Golden Eagle.
	Prince of Wales.
	Salway.

CLASS II.—CLINGSTONE PEACHES.

Flesh firm, adhering to the stone.

The divisions and subdivisions in this class are the same as in the preceding one, but few of the varieties are worthy of cultivation in this country.

Division 3.—*Leaves crenate, with globose glands.*

Flowers large.

Alexander.

Division 4.—*Leaves crenate, with reniform glands.*

Flowers small.

Early Louise.

DESCRIPTION OF VARIETIES.

A'bec.—Fruit large, round, yellowish-green on shaded side, deep-red where exposed to the sun; flesh melting, juicy, sweet, and richly-flavoured. Ripening mid-August;



Fig. 993.—Peach. Bellegarde. (4.)

a first-rate variety. Tree tender; one of the best for second early house.

Alexander.—Fruit large, round, somewhat flattened, greenish-white on shaded side, very dark-red where exposed to the sun; flesh greenish-white, clinging slightly, tender, juicy, and of good flavour. The best of the very early varieties, but difficult to manage under warm treatment under glass, owing to premature development of the buds in the autumn, which causes them to fall in the spring; good for a cold house. Also ripens on a south wall about July 19th. It is similar to Amsden, June, and Waterloo, and was introduced from Illinois, U.S.A., by Mr. Rivers in 1874.

Alexandra Noblesse.—Fruit very large, round; skin pale, with the exception of some red dots on the side next the sun; flesh white, pale at the stone, from which it parts freely, juicy, melting, rich, and vinous. A seedling from the old Noblesse, but, unlike that variety, the tree is not subject to mildew. It ripens in the middle of August.

Barrington.—Fruit large, somewhat elongated; skin downy, deep-red next the sun, pale yellowish-green on the shaded side; flesh whitish-green, slightly rayed with red at the stone, from which it parts freely, very juicy, melting, rich, and of high flavour. The tree is vigorous and less subject to mildew than most others. Mid-September.

Belle Baucé.—Fruit large, round, somewhat depressed and hollowed at the summit; skin thin, downy, of a fine clear colour, the greater portion of the fruit, however, being profusely covered with deep-red; flesh white, red next the stone, very tender, juicy, melting, and rich. A very handsome and delicious Peach. Ripe in the middle of September.

Bellegarde (fig. 993).—Fruit large, globular; skin dark-red, streaked with dark-purple or violet next the sun, pale-green, slightly tinged with yellow on the shaded side; flesh pale-yellow, parting freely from the stone, at which it is slightly rayed with red; melting, juicy, rich, and

excellent. Ripens mid-September. The tree is very healthy, and is not subject to mildew.

Crawford's Early.—Fruit very large and handsome, roundish, sometimes conical, deep-yellow, bright-red next the sun; flesh yellow, juicy, melting, and of good flavour under glass; not usually a success when grown outside.

Late August.

Crimson Galande (fig. 967).—Fruit medium, round, somewhat flattened, and often indented at the apex; skin thin, pale, speckled with red, very dark red on the sunny side; flesh white, marked with red next the stone, very tender, melting, juicy, and of excellent flavour. One of the very best. The tree has a good constitution, bears freely, and stands forcing well. Late August.

Dagmar.—Fruit large, handsome, somewhat elongated, dotted and shaded with red, highly coloured next the sun; flesh white, very tender, melting, juicy, sweet, and of good flavour; skin thin. A first-rate cropper. Early August.

Dr. Hogg (fig. 994).—Fruit large, round; skin very pale yellow, with a slight tinge of crimson next the sun; flesh yellowish-white, red at the stone, from which it parts freely, firm, melting, with a sweet rich flavour. Ripens about the first week in August. The tree is a strong, vigorous grower, and bears abundantly.

Dymond.—Fruit large, round and even in outline; skin greenish-yellow with red dots, bright-red next the sun; flesh white, juicy, melting, sweet, and of good flavour. A first-class variety. Unsurpassed for exhibition. It bears well outside.

Early Alfred.—Fruit large, elongated, often bearing a nipple at the apex, yellowish-green dotted with red, bright-

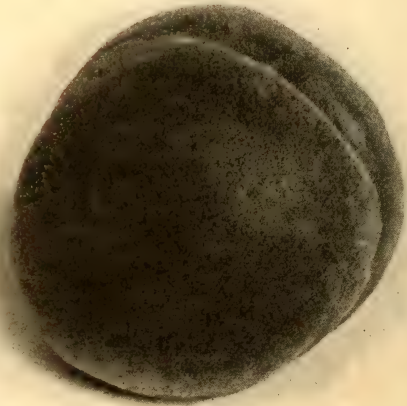


Fig. 994.—Peach. Dr. Hogg. (4.)

red where exposed to the sun; flesh white, very tender, melting, juicy, and of good flavour. A very useful variety for forcing. Tree hardy, robust, and a great bearer. Early August.

Early Beatrice.—Fruit of medium size, roundish; skin thin, downy, of a marbled-red colour on the exposed side; flesh white, moderately rich, and juicy. One of the earliest Peaches. The fruit is much larger if the tree is worked on the Brompton stock. Raised by Mr. Rivers from a seedling White Nectarine. Mid-July.

Early Louise.—Fruit of medium size, roundish; skin bright-red on the exposed side; flesh melting, moderately juicy and rich, and clinging slightly to the stone. Ripens very early.

Golden Eagle.—Fruit round, very large and handsome, deep-yellow, highly coloured with red next the sun; flesh

at Ketton Hall measured 12 inches in circumference and weighed 14 ozs. Late September.

Noblesse.—Fruit large, globular, depressed on the summit, sometimes rather pointed; skin slightly downy, pale yellowish-green, streaked and blotched red on the side next the sun; flesh white to the stone, from which it parts freely, melting, very juicy, rich, and excellent. Early September.

Prince of Wales.—Fruit varying much in shape, especially if forced, when it resembles Barrington, but grown in a cool house it is round and even in outline; skin green, shaded with very bright red where exposed to the sun; flesh greenish-white, very tender, juicy, melting, and of good flavour. Bears abundantly. One of the best autumn kinds. Mid-September.

Princess of Wales.—Fruit very large, round, and pointed; skin pale-cream with a rosy cheek, very clear and beautiful; flesh melting, juicy, rich, and excellent, having a tinge of red at the stone. A very fine and handsome late Peach. Very excellent for late supply. A fruit grown at Ketton Hall measured 12 inches in circumference and weighed 14 ozs. Late October.

Rivers' Early York.—Fruit medium, ovate; skin downy, greenish-white, deep-red on the side next the sun, and frequently much spotted and mottled on the shaded side; flesh white, melting, juicy, and tolerably richly flavoured. A fine early Peach of good constitution; an improvement on the old Early York. Early- or mid-August.

Royal George.—Fruit large, globular; skin very downy, deep-red next the sun, pale greenish-white dotted with red on the shaded side; flesh pale-yellow, rayed with red at the stone, from which it parts freely, very juicy, melting, rich, and vinous. The tree is a good bearer and forces well, but is subject to mildew. Late August.

yellow, tender, juicy, and of rich piquant flavour. The best of the yellow-fleshed varieties. Early October.

Goshawk.—Fruit large, round, green, striped and flushed with dull-red next the sun; flesh white, very tender, melting, juicy, and of exceptionally rich flavour. The tree is vigorous, and a good cropper. Of American origin. One of the finest mid-season varieties.

Grosse Mignonne (Early).—Fruit large, round, somewhat depressed, hollowed at the summit, furnished with a deep suture; skin slightly downy, pale-yellow mottled with red towards the sunny side, which is of a dark-red colour; flesh pale-yellow, rayed with red at the stone, from which it parts freely, melting, juicy, very rich, and vinous. The fruit does not bear carriage well. The tree is a good bearer, forces well, and is not subject to mildew. Late-August, early-September.

Hales' Early.—Fruit large, round, green flushed with red, dark-crimson where exposed to the sun; flesh white, tender, juicy, and of moderately good flavour. A very useful variety, ripening about the end of July.

Late Admirable.—Fruit large, roundish, somewhat oblong, with a slight depression at the summit, in which there is commonly a small nipple; skin downy, dull-crimson with dark streaks next the sun, pale-green on the shaded side, slightly mottled at the junction of the two colours; flesh pale yellowish-green, red at the stone, from which it parts freely, melting, and very juicy. One of the best late Peaches either for the open ground or forcing. Mid- or late-September.

Nectarine Peach.—Fruit very large, somewhat elongated, often with a prominent nipple at the apex, greenish-yellow, blotched and shaded with red next the sun; flesh white, tender, juicy, and of good flavour when grown under glass. A very fine autumn variety for a cool house. A fruit grown

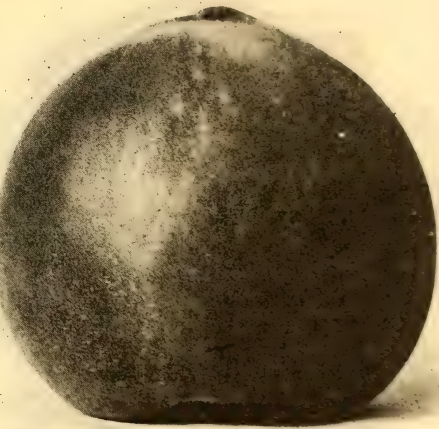


Fig. 996.—Peach. Stirling Castle. (4.)

Salway.—Fruit large, round, rather flattened; skin of a dull greenish-yellow colour, darker on the most exposed side; flesh of a deep-orange, juicy, melting, and moderately rich when well ripened, adhering slightly to the stone. A very late and valuable Peach, ripening in the end of October and beginning of November. It is of a good flavour under glass if judiciously ripened with fire-heat.

Sea Eagle.—Fruit very large, somewhat elongated; skin



Fig. 995.—Peach. Rivers' Early York. (4.)

very downy, greenish-white, bright-red where exposed to the sun; flesh white, marked with red next the stone, sweet, juicy, and of good flavour. An excellent Peach for a cool house, but not suitable for outside culture north of London. It has produced fruit at Ketton Hall which

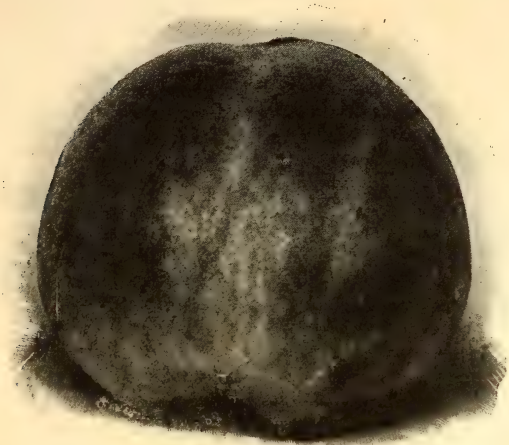


Fig. 997.—Peach. Violette Hâtive. (4.)

were over 12 inches in circumference and weighed 16½ ozs. Late September.

Stirling Castle (fig. 996).—Fruit medium, roundish; skin light, with a marbled-red cheek; flesh white, free, melting, rich, and excellent. A fine hardy-constituted Peach, and one that should be in every collection, ripening in the beginning of September.

Violette Hâtive (fig. 997).—Fruit medium, round and even in outline; skin greenish-white, dark-red where exposed to the sun; flesh white, juicy, sweet, and of good flavour, not so soft as some varieties, and therefore travels well. One of the best and hardiest varieties grown. It bears forcing well.

Walburton Admirable (fig. 965).—Fruit large, round; skin pale yellowish-green, crimson next the sun, mottled and clouded with darker colour; flesh yellowish-white, melting, juicy, rich, and high-flavoured. Ripens end of September or beginning of October. The tree is very hardy, and a good bearer. A most excellent late variety.

Six best Varieties for Early Forcing, in order of ripening.

Alexander. ¹	Early Grosse Mignonne.
Early Louise.	Royal George.
Early Alfred.	Stirling Castle.

Twelve best Varieties for a Cool House, in order of ripening.

Alexander.	Goshawk.
Early Louise.	Bellegarde.
Hales' Early.	Prince of Wales.
Rivers' Early York.	Princess of Wales.
Royal George.	Sea Eagle.
Crimson Galande.	Nectarine Peach.

¹ Apt to develop its buds too much in the autumn, and must be retarded as much as possible.

Twelve best Varieties for Outside Culture.

Alexander.	Stirling Castle.
Early Louise.	Alexandra Noblesse.
Hales' Early.	Bellegarde.
Rivers' Early York.	Princess of Wales.
Crimson Galande.	Sea Eagle.
Dymond.	Late Admirable.

Twelve best Varieties for Exhibition, in order of merit.

Royal George.	Bellegarde.
Crimson Galande.	Princess of Wales.
Early Grosse Mignonne.	Sea Eagle.
Stirling Castle.	Nectarine Peach.
Barrington.	Golden Eagle.
Prince of Wales.	Crawford's Early.

NECTARINES.

The method of classification adopted for the varieties of the Peach is also applicable to those of the Nectarine.

FLESH MELTING, PARTING FROM THE STONE.

Division 1.—*Leaves crenate, with globose glands.*

Subdivision 1.—Flowers large.	Subdivision 2.—Flowers small.
Humboldt.	Elruge.
Pine Apple.	Stanwick Elruge.

Division 2.—*Leaves crenate, with reniform glands.*

Subdivision 1.—Flowers large.	
Byron.	Pitmaston Orange.
Cardinal.	Rivers' Orange.
Early Rivers.	Spenser.
Goldoni.	White.
Lord Napier.	
Subdivision 2.—Flowers small.	
Balgowan.	Victoria.
Downton.	Violette Hâtive.
Dryden.	

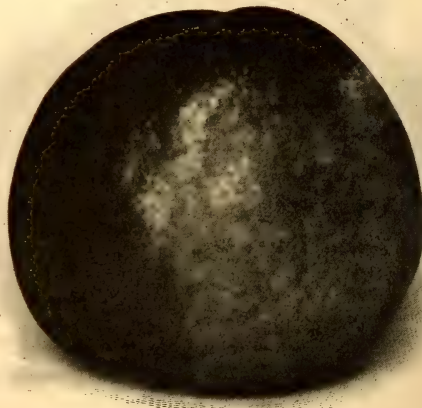


Fig. 998.—Nectarine. Elruge. (3.)

Balgowan.—Fruit considerably larger than Violette Hâtive, roundish oval, broadest at the base; skin greenish-

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